



CHAPTER 1

GENERAL INFORMATION

1

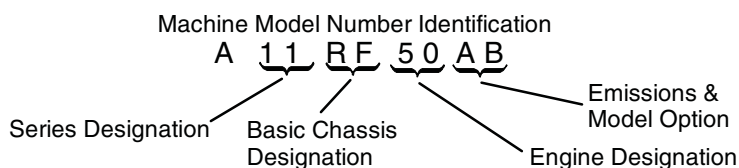
Model Identification	1.2
Serial Number Location	1.2
Models Numbers / Replacement Key	1.3
Machine Dimensions	1.4-1.5
Specifications - <i>RANGER</i> 2X4	1.6-1.7
Specifications - <i>RANGER</i> 4X4	1.8-1.9
Specifications - <i>RANGER</i> 6X6	1.10-1.11
Publication Numbers	1.12
Paint Codes	1.12
Starting the <i>RANGER</i>	1.12





MODEL IDENTIFICATION

The machine model number must be used with any correspondence regarding warranty or service.



Engine Designation Number

42	EH42PLE06 Single, L/C, SOHC 4 Stroke, Electric Start
50	EH50PLE16 Single, L/C, SOHC 4 Stroke, Electric Start

VIN Identification

World Mfg. ID			Vehicle Description						Vehicle Identifier							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	X	A	R	F	5	0	A	*	1	P	0	0	0	0	0	0
			Body Style		Powertrain		Engine		Emissions		Check Digit		Model Year		Plant No.	
															Individual Serial No.	

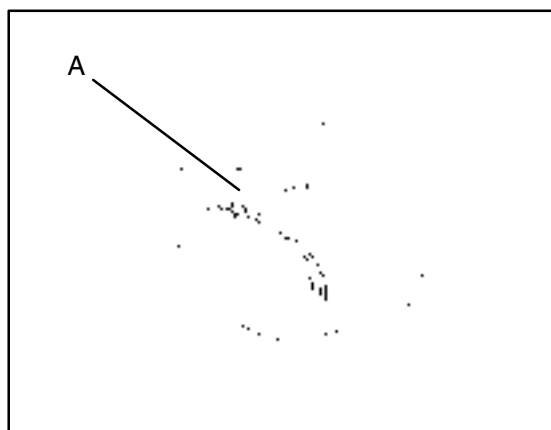
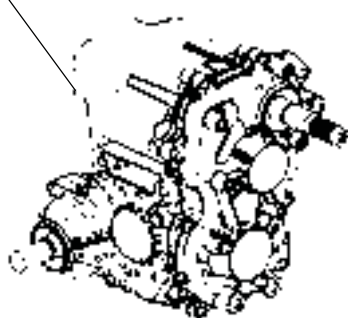
* This could be either a number or a letter

ENGINE SERIAL NUMBER LOCATION

Whenever corresponding about an engine, be sure to refer to the engine model number and serial number. This information can be found on the sticker applied to the flywheel housing on the right side of engine.(A) An additional number is stamped on the center top of crankcase beneath the cylinder coolant elbow.

TRANSMISSION I.D. NUMBER LOCATION

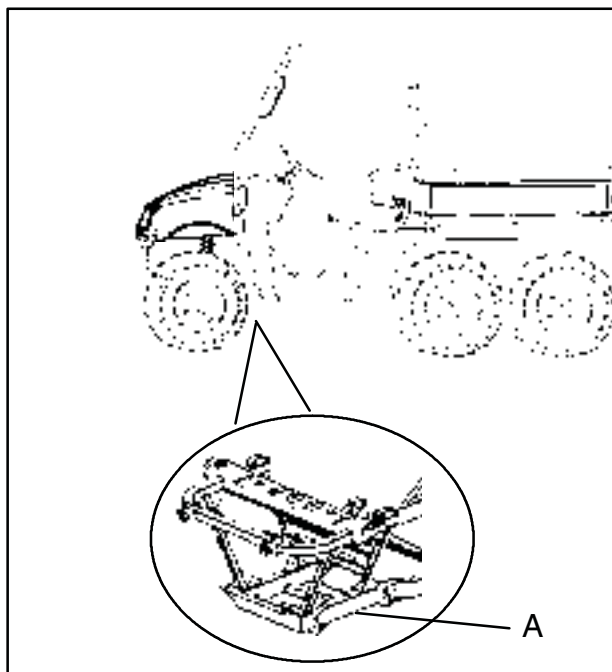
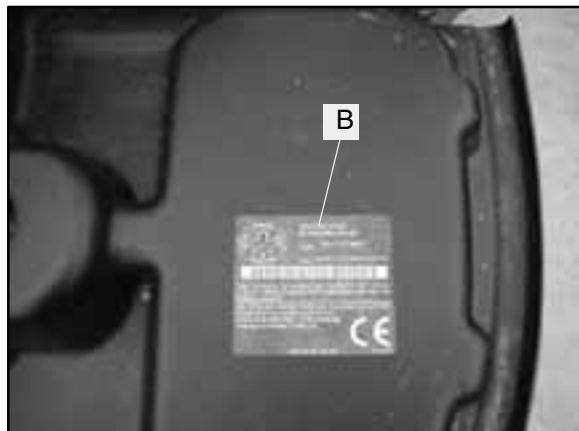
The transmission I.D. number is located on the right side of machine.





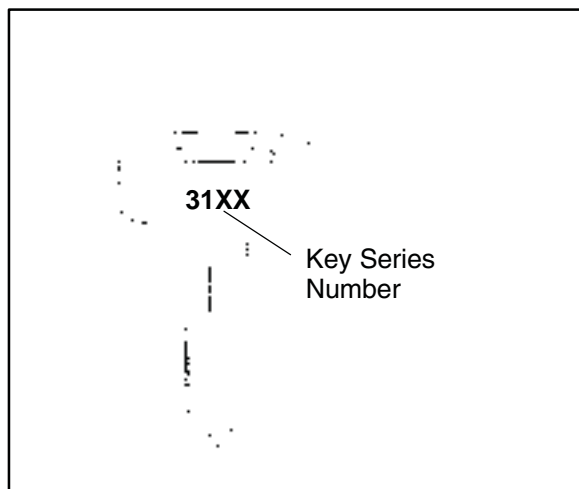
MACHINE MODEL NUMBER AND SERIAL NUMBER LOCATION

The machine model number and serial number are important for vehicle identification. The machine serial number (A) is stamped on the lower frame rail close to the front drive wheel. The model and serial number (B) are also located on a sticker on the hood liner.



REPLACEMENT KEYS

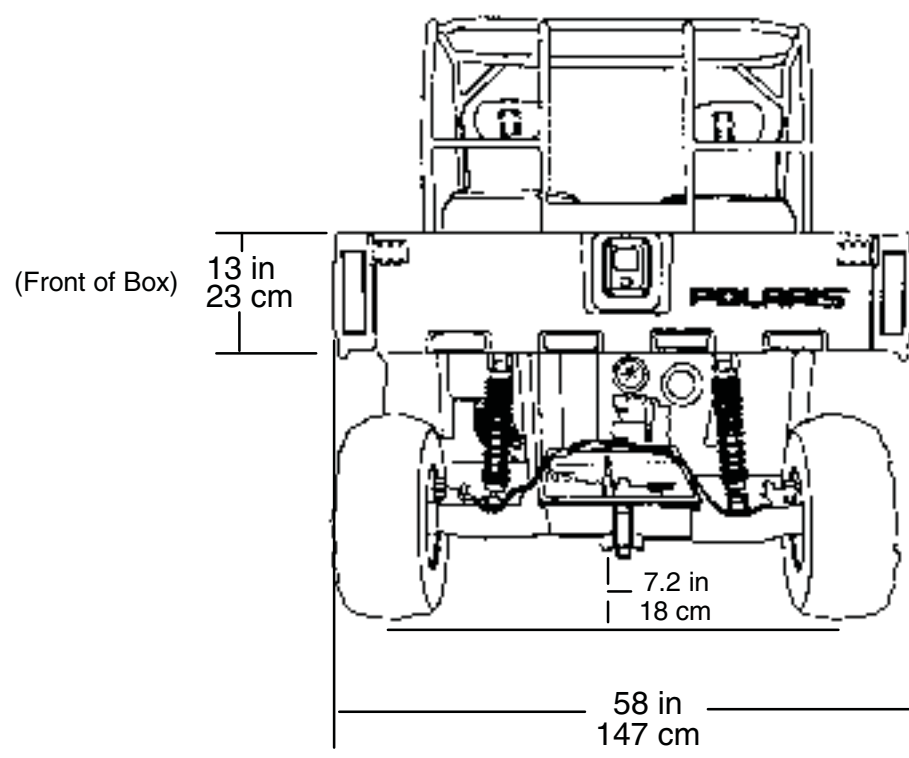
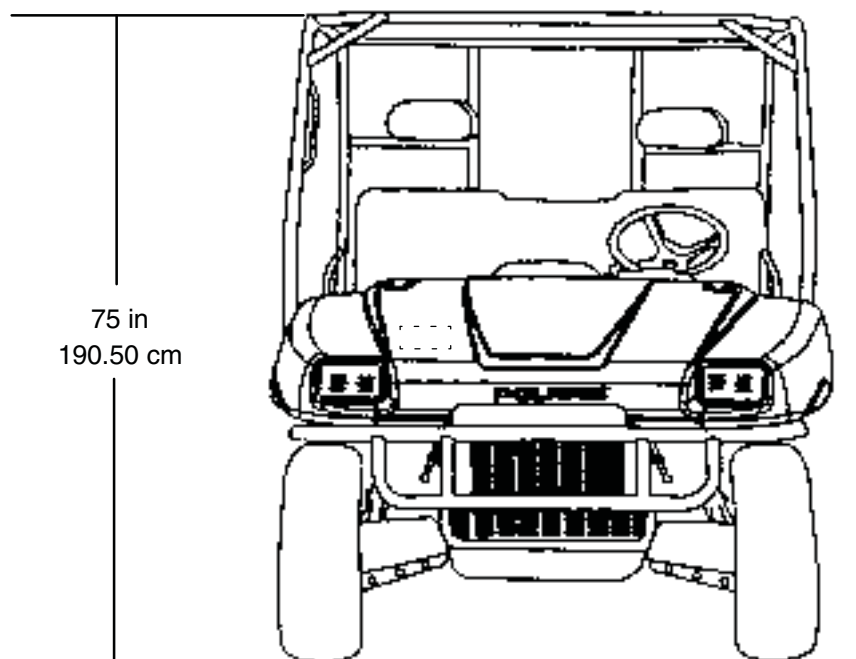
Replacement keys can be made from the original key. To identify which series the key is, take the first two digits on the original key and refer to the chart to the right for the proper part number.



Series #	Part Number
20	4010278
21	4010278
22	4010321
23	4010321
27	4010321
28	4010321
31	4110141
32	4110148
67	4010278
68	4010278

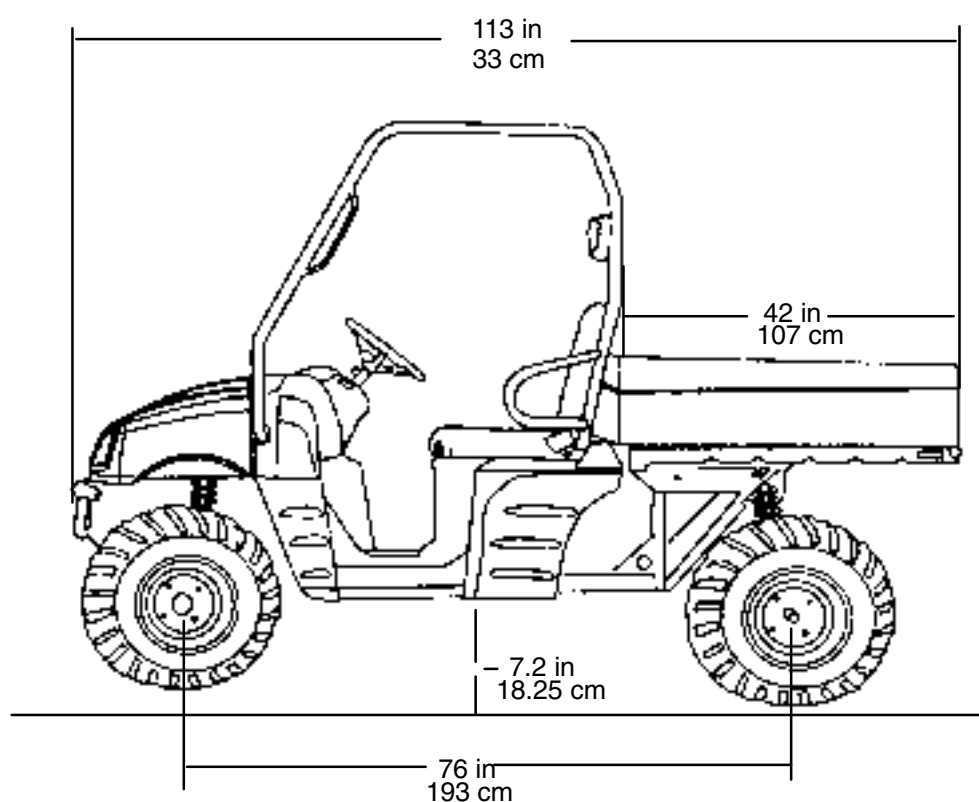
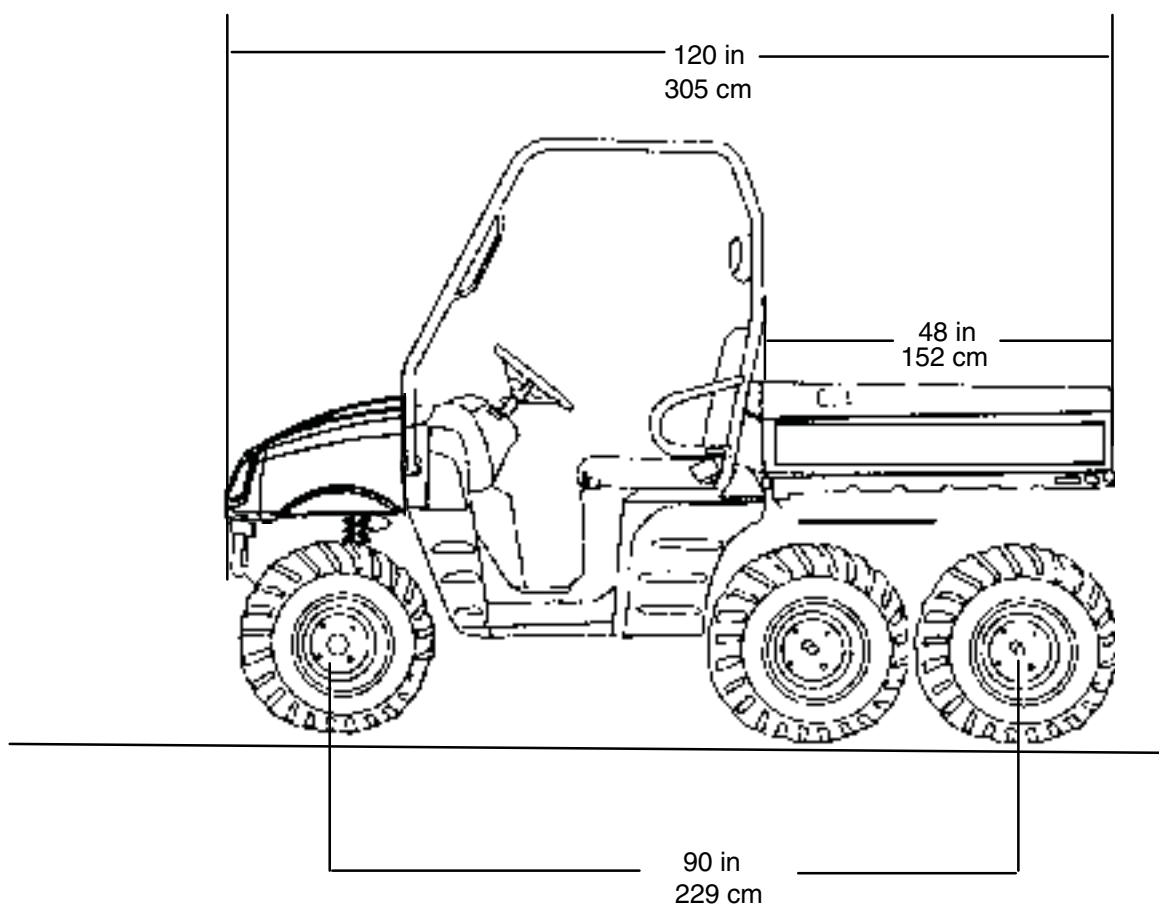


MACHINE DIMENSIONS





MACHINE DIMENSIONS





MODEL SPECIFICATIONS

MODEL: **RANGER 2X4**

MODEL NUMBER: ... A11RB42AA

ENGINE MODEL: EH42PLE06

ELECTRICAL

Flywheel I.D. FF97
 CDI Marking CU2570
 Alternator Output ... 250 Watts
 Ignition Timing 30° BTDC@5000RPM±2°
 Spark Plug / Gap ... NGK BKR5E / 0.036" (0.9mm)
 Lights: Head Dual Beam (2)-35 watt quartz
 Tail 5 watts
 Brake 5 watts
 Indicator 1 watt
 Voltage Regulator .. LR39
 Start System Electric start
 DC Outlet Dash Receptacle
 Battery 30 Amp (12 Volt)

FLUID

Capacity

Type

Fuel Tank 8.5 gals. (32.2L)
 Injector Oil N / A
 Coolant 2.25 qts. (2.1L) .. PP6*
 Transmission 27 oz (800 ml) PPS*
 Gearcase Oil (Front) . N/A
 Gearcase Oil (Rear) . 10 oz (300 ml) ... 80-90
 Gearcase Oil (Middle) N/A
 Engine Oil 2 qts. (1.9L) PP4*
 Brake (Foot) D.O.T.3

Lubricant Key

*PPS Polaris Premium Synthetic Gear Case Oil
 *PP4 Polaris 0W-40 Synthetic Engine Lubricant
 *PDD Premium Demand Drive Hub Fluid
 *PP6 Polaris Premium 60/40 Antifreeze/Coolant

SUSPENSION / CHASSIS

Body Style Series 11
 Front Suspension .. MacPherson Strut
 Middle Suspension . MacPherson Strut
 Turning Radius 186" (472 cm)
 Toe Out 1/8"-1/4" (3-6.35 mm)
 Ground Clearance .. 7.2" (180 mm)
 Front Vertical Travel 6.7" (170 mm)
 Center Vertical Travel 5.25" (133 mm)
 Rear Suspension ... Swing Arm w/Dual Shocks
 Rear Travel 6.25" (158 mm)
 Shock (2)-2" Twin Tubes
 Shock Adjustment .. Cam

DRIVE TRAIN

Transmission Dual Sensing Automatic PVT
 Gear Reduction-Low . 8.66:1
 Gear Reduction-Rev . 5.91:1
 Gear Reduction-Hi ... 3.81:1
 Front Drive Ratio N/A
 Middle Drive Ratio ... N/A
 Final Drive Ratio 3.70:1
 Shift Type InLine EZShift Hi/Lo/Reverse
 Brake Type: Hydraulic Foot Pedal
 Parking Brake Foot Actuated (Mechanical)
 Front & Rear Brake .. Fixed Disc, Hydraulic
 Floating Caliper

TIRES

Tire Size - Front 25 x 10 - 12
 Tire Size - Rear 25 x 11 - 12
 Tire Pressure - F/R . 8-12 psi
 Total Width 60" (152.40 cm)
 Total Length 113" (287 cm)
 Total Height 75" (190.50 cm)
 Wheel Base 76" (193 cm)
 Weight - Dry 1105 lbs. (412 kgs)

LOAD CAPACITY

Cargo Box Dimensions 58x42 x13 in.
 Cargo Box Load Capacity 850 lbs (317 kgs)
 Tow Hitch Receiver Hitch
 Hitch Tongue Capacity 75 lbs (28 kgs)
 Hitch Towing Capacity 1400 lbs (523 kgs)
 *Vehicle Payload 1500 lbs (681 kgs)
 *Payload Includes: One driver and two passengers





MODEL SPECIFICATIONS

MODEL: **RANGER 2X4**

MODEL NUMBER: . A11RB42AA

ENGINE MODEL: .. EH42PLE06

CARBURETION

Type BST 34 Mikuni CV
Main Jet 135
Pilot Jet 42.5
Jet Needle 4LC38-3
Needle Jet P-6 (829)
Pilot Screw 2.25 Turns
Pilot Air Jet 160
Valve Seat 1.2 Viton
Float Height 13mm (.51")
Fuel Octane (R+M/2) . 87 Non-Oxygenated or
89 Oxygenated

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below +5°C	+40° to +80°F +5° to +26°C
Meters (Feet)	0-1800 (0-6000)	140	135
	1800-above (6000- above)	132.5	127.5

CLUTCH

Type PVT
Belt 3211077
Belt Width (Projected) 1.188" (30.18mm)
Drive Belt Deflection 1.125" (28.57 mm)
Side Angle (Overall) 26°
Outside Circumference 40.86 ±.12"
Center Distance 10" (254.5mm)
Clutch Offset 0.5" (12.7mm)
Secondary Spring Black
Driven Helix 41-37
Spring Position (Helix) 2
Spring Position (Sheave) .. 2

CLUTCH CHART

Altitude		Shift Weight	Drive Clutch Spring	Driven Clutch Spring	Helix Spring Angle
Meters (Feet)	0-1800 (0-6000)	10 BH (5630511)	Blue/Green (7041157)	Black (7041782)	41-37 (5132344)
	1800-3700 (6000-12000)	10 RH (5630515)	Blue/Green (7041157)	Black (7041782)	41-37 (5132344)

ENGINE

Type 4 Cycle, Single Cyl.
Displacement 425 cc
Bore 3.46" (92mm)
Stroke 2.76" (75mm)
Valve Clearance In/Ex 0.006/0.006" @ TDC on compression
Compression Ratio 9.2 :1
Cooling Liquid
Lubrication Type Dry Sump
Operating RPM±200 5250 RPM
Idle RPM±200 (lights off) 1200 RPM
Compression Pressure 70-90 psi





MODEL SPECIFICATIONS

MODEL: **RANGER 4x4**

MODEL NUMBER: ... A11RD50AA

ENGINE MODEL: EH50PLE16

ELECTRICAL

Flywheel I.D. FF97
 CDI Marking CU2570
 Alternator Output ... 250 Watts
 Ignition Timing 30° BTDC@5000RPM±2°
 Spark Plug / Gap ... NGK BKR5E / 0.036" (0.9mm)
 Lights: Head Dual Beam (2)-35 watt quartz
 Tail 5 watts
 Brake 5 watts
 Indicator 1 watt
 Voltage Regulator .. LR39
 Start System Electric start
 DC Outlet Dash Receptacle
 Battery 30 Amp (12 Volt)

FLUID	Capacity	Type
Fuel Tank	8.5 gals. (32.2L)	
Injector Oil	N / A	
Coolant	2.25 qts. (2.1L)	.. PP6*
Transmission	13.5 oz (400 ml)	.. PPS*
Gearcase Oil (Front)	5 oz (150 ml) PDD*
Gearcase Oil (Rear)	10 oz (300 ml)80-90
Gearcase Oil (Middle)	N/A	
Engine Oil	2 qts. (1.9L) PP4*
Brake (Foot)	 D.O.T. 3

Lubricant Key

*PPS Polaris Premium Synthetic Gear Case Oil
 *PP4 Polaris 0W-40 Synthetic Engine Lubricant
 *PDD Premium Demand Drive Hub Fluid
 *PP6 Polaris Premium 60/40 Antifreeze/Coolant

SUSPENSION / CHASSIS

Body Style Series 11
 Front Suspension .. MacPherson Strut
 Middle Suspension .. MacPherson Strut
 Tow Capacity 1500 lbs. (680 kg)
 Turning Radius 150" (381 cm)
 Toe Out 1/8"-1/4" (3-6.35 mm)
 Ground Clearance .. 7.2" (180 mm)
 Front Vertical Travel 6.7" (170 mm)
 Center Vertical Travel 5.25" (133 mm)
 Rear Suspension ... Swing Arm w/Dual Shocks
 Rear Travel 6.25" (158 mm)
 Shock (2)-2" Twin Tubes
 Shock Adjustment .. Cam

DRIVE TRAIN

Transmission Dual Sensing Automatic PVT
 Gear Reduction-Low . 8.66:1
 Gear Reduction-Rev . 5.91:1
 Gear Reduction-Hi ... 3.81:1
 Front Drive Ratio ... 3.83:1
 Middle Drive Ratio ... N/A
 Final Drive Ratio ... 3.70:1
 Shift Type InLine EZShift Hi/Lo/Reverse
 Brake Type: Hydraulic Foot Pedal
 Parking Brake Foot Actuated (Mechanical)
 Front & Rear Brake .. Fixed Disc, Hydraulic
 Floating Caliper

TIRES

Tire Size - Front 25 x 10 - 12
 Tire Size - Rear 25 x 11 - 12
 Tire Pressure - F/R . 8-12 psi
 Total Width 60" (152.40 cm)
 Total Length 113" (287 cm)
 Total Height 75" (190.50 cm)
 Wheel Base 76" (193 cm)
 Weight - Dry 1185 lbs. (442 kg)

LOAD CAPACITY

Cargo Box Dimensions 58x428x13 in
 Cargo Box Load Capacity 1000 lbs (454 kgs)
 Tow Hitch Receiver Hitch
 Hitch Tongue Capacity 75 lbs (28 kgs)
 Hitch Towing Capacity 1500 lbs (681 kgs)
 *Vehicle Payload 1500 lbs (681 kgs)
 *Payload Includes: One driver and two passengers



MODEL SPECIFICATIONS

MODEL: **RANGER 4X4**

MODEL NUMBER: . A11RD50AB

ENGINE MODEL: .. EH50PLE16

CARBURETION

Type BST 34 Mikuni CV
Main Jet 142.5
Pilot Jet 42.5
Jet Needle 4MB32-3
Needle Jet P-8
Pilot Screw 2.5 Turns
Pilot Air Jet 160
Valve Seat 1.2 Viton
Float Height 13mm (.51")
Fuel Octane (R+M/2) . 87 Non-Oxygenated or
89 Oxygenated

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below +5°C	+40° to +80°F +5° to +26°C
Meters (Feet)	0-1800 (0-6000)	140	142.5
	1800-above (6000- above)	132.5	127.5

CLUTCH

Type PVT
Belt 3211077
Belt Width (Projected) 1.188" (30.18mm)
Drive Belt Deflection 1.125" (28.57 mm)
Side Angle (Overall) 26°
Outside Circumference 40.86 ±.12"
Center Distance 10" (254.5mm)
Clutch Offset 0.5" (12.7mm)
Secondary Spring Black
Driven Helix 40
Spring Position (Helix) 2
Spring Position (Sheave) .. 2

CLUTCH CHART

Altitude		Shift Weight	Drive Clutch Spring	Driven Clutch Spring	Helix Spring Angle
Meters (Feet)	0-1800 (0-6000)	10 MH (5630513)	Blue/Green (7041157)	Black (7041782)	40 (5131446)
	1800-3700 (6000-12000)	10 WH (5630515)	Blue/Green (7041157)	Black (7041782)	40 (5131446)

ENGINE

Type 4 Cycle, Single Cyl.
Displacement 499 cc
Bore 3.625" (92mm)
Stroke 2.955" (75mm)
Valve Clearance In/Ex 0.006/0.006" @ TDC on compression
Compression Ratio 10.2:1
Cooling Liquid
Lubrication Type Dry Sump
Operating RPM±200 5250 RPM
Idle RPM±200 (lights off) 1200 RPM
Compression Pressure 70-90 psi



MODEL SPECIFICATIONS

MODEL: **RANGER 6x6**

MODEL NUMBER: ... **A11RF50AA**

ENGINE MODEL: **EH50PLE16**

ELECTRICAL

Flywheel I.D. FF97
 CDI Marking CU2570
 Alternator Output ... 250 Watts
 Ignition Timing 30° BTDC@5000RPM±2°
 Spark Plug / Gap ... NGK BKR5E / 0.036" (0.9mm)
 Lights: Head Dual Beam (2)-35 watt quartz
 Tail 5 watts
 Brake 5 watts
 Indicator 1 watt
 Voltage Regulator .. LR39
 Start System Electric start
 DC Outlet Dash Receptacle
 Battery 30 Amp (12 Volt)

FLUID

Capacity

Type

Fuel Tank 8.5 gals. (32.2L)
 Injector Oil N / A
 Coolant 2.25 qts. (2.1L) .. PP6*
 Transmission 13.5 oz (400 ml) .. PPS*
 Gearcase Oil (Front) . 5 oz (150 ml) PDD*
 Gearcase Oil (Rear) . 10 oz (300 ml) ... 80-90
 Gearcase Oil (Middle) 6.75 oz (200 ml) .. 80-90
 Engine Oil 2 qts. (1.9L) PP4*
 Brake (Foot) D.O.T.3

Lubricant Key

*PPS Polaris Premium Synthetic Gear Case Oil
 *PP4 Polaris 0W-40 Synthetic Engine Lubricant
 *PDD Premium Demand Drive Hub Fluid
 *PP6 Polaris Premium 60/40 Antifreeze/Coolant

SUSPENSION / CHASSIS

Body Style Series 11
 Front Suspension .. MacPherson Strut
 Middle Suspension . MacPherson Strut
 Tow Capacity 1500 lbs. (680 kg)
 Turning Radius 150" (381 cm)
 Toe Out 1/8"-1/4" (3-6.35 mm)
 Ground Clearance .. 7.2" (180 mm)
 Front Vertical Travel 6.7" (170 mm)
 Center Vertical Travel 5.25" (133 mm)
 Rear Suspension ... Swing Arm w/Dual Shocks
 Rear Travel 6.25" (158 mm)
 Shock (2)-2" Twin Tubes
 Shock Adjustment .. Cam

TIRES

Tire Size - Front 25 x 10 - 12
 Tire Size - Rear 25 x 11 - 12
 Tire Pressure - F/R . 8-12 psi
 Total Width 60" (152.40 cm)
 Total Length 120" (305 cm)
 Total Height 75" (190.50 cm)
 Wheel Base 90" (229 cm)
 Dry Weight. 1410 lbs. (526 kg)

DRIVE TRAIN

Transmission Dual Sensing Automatic PVT
 Gear Reduction-Low . 8.66:1
 Gear Reduction-Rev . 5.91:1
 Gear Reduction-Hi ... 3.81:1
 Front Drive Ratio ... 3.83:1
 Middle Drive Ratio ... 3.70:1
 Final Drive Ratio ... 3.70:1
 Shift Type InLine EZShift Hi/Lo/Reverse
 Brake Type: Hydraulic Foot Pedal
 Parking Brake Foot Actuated (Mechanical)
 Front & Rear Brake .. Fixed Disc, Hydraulic
 Floating Caliper

LOAD CAPACITY

Cargo Box Dimensions 58x48x13 in.
 Cargo Box Load Capacity 1000 lbs (454 kgs)
 Tow Hitch Receiver Hitch
 Hitch Tongue Capacity 75 lbs (28 kgs)
 Hitch Towing Capacity 1500 lbs (681 kgs)
 *Vehicle Payload 1500 lbs (681 kgs)
 *Payload Includes: One driver and two passengers





MODEL SPECIFICATIONS

MODEL: RANGER 6x6**MODEL NUMBER: . A11RF50AA****ENGINE MODEL: .. EH50PLE16**

CARBURETION

Type BST 34 Mikuni CV
Main Jet 142.5
Pilot Jet 42.5
Jet Needle 4MB32-3
Needle Jet P-8
Pilot Screw 2.5 Turns
Pilot Air Jet 160
Valve Seat 1.2 Viton
Float Height 13mm (.51")
Fuel Octane (R+M/2) . 87 Non-Oxygenated or
89 Oxygenated

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below +5°C	+40° to +80° F +5° to +26° C
Meters (Feet)	0-1800 (0-6000)	140	142.5
	1800-above (6000- above)	132.5	127.5

CLUTCH

Type PVT
Belt 3211077
Belt Width (Projected) 1.188" (30.18mm)
Side Angle (Overall) 26°
Outside Circumference 40.86 ±.12"
Drive Belt Deflection 1.125 " (28.57 mm)
Center Distance 10" (254.5mm)
Clutch Offset 0.5" (12.7mm)
Secondary Spring Silver
Driven Helix 41-37
Spring Position (Helix) 1
Spring Position (Sheave) .. 1

CLUTCH CHART

Altitude		Shift Weight	Drive Clutch Spring	Driven Clutch Spring	Helix Spring Angle
Meters (Feet)	0-1800 (0-6000)	G (5630514)	Blue/Green (7041157)	Silver (7041499)	41-37 (5132344)
	1800-3700 (6000-12000)	F (5630515)	Blue/Green (7041157)	Silver (7041499)	41-37 (5132344)

ENGINE

Type 4 Cycle, Single Cyl.
Displacement 498 cc
Bore 3.625" (92mm)
Stroke 2.955" (75mm)
Valve Clearance In/Ex 0.006/0.006" @ TDC on compression
Compression Ratio 10.2:1
Cooling Liquid
Lubrication Type Dry Sump
Operating RPM±200 5250 RPM
Idle RPM±200 (lights off) 1200 RPM
Compression Pressure 70-90 psi





PUBLICATION NUMBERS

Model	Model No.	Owner's Manual PN	Parts Manual PN	Service Manual PN	Parts Micro Fiche PN
<i>RANGER</i> 2x4 <i>RANGER</i> 4x4 <i>RANGER</i> 6x6	A11RB42AA A11RD50AA A11RF50AA	9918176	99118179	9918071	9918180

When ordering service parts be sure to use the correct parts manual.

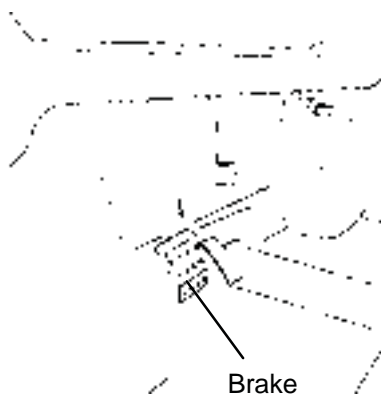
PAINT CODES

PAINTED PART	COLOR DESCRIPTION	DITZLER NUMBER	POLARIS NUMBER
Springs	Medium Gloss Black	9440	P-067
Hood/Dash	Eddie Bauer Green	44931	P-195
Frame/Cab	Medium Gloss Black	9440 / 8520147	P-067

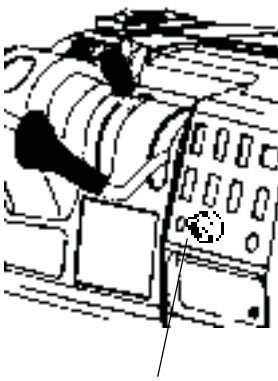
Order direct from Midwest Industrial Coatings (952-942-1840). Mix as directed.

STARTING THE *RANGER*

NOTICE: To start the Series 11 *RANGER*, the foot brake must be depressed to start the machine. The *RANGER* utilizes this safety feature to help prevent any possible injury or accidents that may occur during initial machine startup.



1. Press down on the foot brake.



2. Turn the ignition key to start the *Ranger*.



CHAPTER 2 **MAINTENANCE**

Periodic Maintenance Chart	2.2-2.3
Polaris Lubricant and Service Part Numbers .	2.4
Special Tools	2.5
Pre-Ride Inspection	2.5
Lubrication Charts	2.6-2.8
Front Gearcase Lubrication	2.9
Middle Gearcase Lubrication	2.9-2.10
Rear Gearcase Lubrication	2.10-2.11
Transmission Lubrication	2.11-2.12
Shift Linkage Adjustment	2.13
Throttle Pedal Inspection	2.14
Fuel System	2.14-2.17
Battery Maintenance	2.17-2.18
Spark Plug / Electrical	2.18-2.19
Engine Coolant System	2.19-2.22
Air Filter / Breather Filter	2.22-2.24
Flywheel Housing	2.24
Oil Level and Filter Change	2.25-2.26
Oil Pump Priming Procedure	2.26
Valve Adjustment	2.27-2.28
Steering and Toe Alignment	2.28-2.29
Exhaust Pipe	2.30
Brake System	2.30-2.31
Wheel and Tire	2.31-2.32
Suspension	2.32-2.33



PERIODIC MAINTENANCE CHART

Inspection, adjustment and lubrication intervals of important components is listed in the following chart. Maintenance intervals are based upon average riding conditions and a vehicle speed of approximately 10 mph. Inspect, clean, lubricate, adjust or replace parts as necessary. **NOTE:** Inspection may reveal the need for replacement parts. Always use genuine Polaris parts.

■ **CAUTION:** Due to the nature of these adjustments, it is recommended that service be performed by an authorized Polaris dealer.

► **Vehicles subjected to severe use (operation in wet or dusty areas, low speed heavy load operation, prolonged idle) should be inspected and serviced more frequently. For engine oil, short trip cold weather riding also constitutes severe use.** Pay special attention to oil level. A rise in oil level in cold weather can indicate moisture collecting in the oil tank. Change oil immediately if oil level begins to rise.

E Emission Control System Service (California).

PERIODIC MAINTENANCE - ENGINE					
		Frequency (Whichever comes first)			Remarks
	Item	Hours	Calendar	Miles (Km)	
E►	Engine Oil - Level/Change	100 hrs	6 months	N/A	Check Level Daily; Break In service at 1 month
E	Oil Filter	100 hrs	6 months	N/A	Replace with oil change
E►	Air Filter - Main Element	Weekly	Weekly	N/A	Inspect - Replace if necessary
►	Air Box Sediment Tube	-	Daily	N/A	Drain deposits whenever visible
►	Engine Breather Filter	25 hrs	Monthly	N/A	Inspect and replace if necessary
►	Oil Tank Vent Hose	100 hrs	12 months	N/A	Inspect hose routing /hose condition
E■	Valve Clearance	100 hrs	12 months	N/A	Inspect/Adjust
E	Idle Speed	As required	As required	N/A	Adjust
	Choke (Enricher) Cable	50 hrs	6 months	N/A	Inspect -Adjust, Lubricate, Replace if necessary
	Carburetor Float Bowl	50 hrs	6 months	N/A	Drain bowl periodically and prior to storage
	Carburetor Air Intake Ducts/Flange	50 hrs	6 months	N/A	Inspect all ducts for proper sealing/air leaks
E■	Fuel System	100 hrs	12 months	N/A	Check for leaks at tank cap, lines, filter, pump & carburetor. Replace lines every 2 years.
CHASSIS					
		Frequency (Whichever comes first)			Remarks
	Item	Hours	Calendar	Miles (Km)	
E■	Fuel Filter	100 hrs	12 months	N/A	Replace filter annually
	Coolant/Level Inspection	Daily	Daily	N/A	Replace engine coolant every 2 years
	Coolant Strength / Pressure Test System	100 hrs	6 months	N/A	Inspect strength seasonally; Pressure test system annually
	Radiator	100 hrs	12 months	N/A	Inspect / Clean external surface
	Cooling System Hoses	100 hrs	12 months	N/A	Inspect
	Engine Mounts	100 hrs	12 months	N/A	Inspect
	Drain Recoil Housing	Weekly	Weekly	N/A	More often if operating in wet environment
	Exhaust Muffler / Pipe	100 hrs	12 months	N/A	
ELECTRICAL					
E	Spark Plug	100 hrs	12 months	N/A	Inspect - Replace if necessary
	Wiring	100 hrs	12 months	N/A	Inspect for abrasion, routing, security



CHASSIS					
		Frequency (Whichever comes first)			
	Item	Hours	Calendar	Miles (Km)	Remarks
	Ignition Timing	100 hrs	12 months	N/A	Inspect
	Battery	25 hrs	Monthly	N/A	Check terminals; Clean; Check fluid level
	Headlight Aim	As required	As required	N/A	Adjust if Necessary
	Headlamp Inspection	Daily	Daily	N/A	Check operation daily; Apply Nyogel™ Grease to connector when lamp is replaced
	Tail Lamp Inspection	Daily	Daily	N/A	Check Operation Daily; Apply Nyogel™ Grease to socket when lamp is replaced
▶	General Lubrication	50 hrs	3 months	N/A	Lubricate All Fittings, Pivots, Cables, Etc.
▶	Front Gearcase Lubricant	100 hrs	12 months	N/A	Inspect Monthly; Change Annually
▶	Middle Gearcase Lubricant	100 hrs	12 months	N/A	Inspect Monthly; Change Annually
▶	Rear Gearcase Lubricant	100 hrs	12 months	N/A	Inspect Monthly; Change Annually
	Drive Belt	50 hrs	6 months	N/A	Inspect - Adjust, Replace if Necessary
	Clutches (Drive And Driven)	100 hrs	12 months	N/A	Inspect, Clean
▶	Transmission Oil Level	25 hrs	Monthly	N/A	Inspect Monthly; Change Annually
	Shift Linkage	50 hrs	6 months	N/A	Inspect, Lubricate, Adjust
■	Steering	50 hrs	6 months	N/A	Inspect Daily, Lubricate
■	Toe Adjustment	As required	As required	N/A	Periodic Inspection, Adjust When Parts are Replaced
▶	Front Suspension	50 hrs	6 months	N/A	Inspect - Lubricate
▶	Rear Suspension	50 hrs	6 months	N/A	Inspect - Lubricate
	Tires	Pre-ride	Pre-ride	N/A	Inspect Daily, Pre-Ride Inspection Item
■	Brake Fluid	200 hrs	24 months	N/A	Change Every Two Years
▶	Brake Fluid Level	Pre-ride	Pre-ride	N/A	Inspect Daily, Pre-Ride Inspection Item
▶	Brake Lever Travel	Pre-ride	Pre-ride	N/A	Inspect Daily, Pre-Ride Inspection Item
■	Brake Pad Wear	25 hrs	Monthly	N/A	Inspect Periodically
	Auxiliary Brake Adjustment	As required	As required	N/A	Inspect Deflection Daily; Adjust
	Brake System	Pre-ride	Pre-ride	N/A	Pre-Ride Inspection Item
	Wheels	Pre-ride	Pre-ride	N/A	Pre-Ride Inspection Item
	Frame Nuts, Bolts, Fasteners	Pre-ride	Pre-ride	N/A	Pre-Ride Inspection Item

■ **CAUTION:** Due to the nature of these adjustments, it is recommended that service be performed by an authorized Polaris dealer.

▶ **Vehicles subjected to severe use (operation in wet or dusty areas, low speed heavy load operation, prolonged idle) should be inspected and serviced more frequently. For engine oil, short trip cold weather riding also constitutes severe use.** Pay special attention to oil level. A rise in oil level in cold weather can indicate moisture collecting in the oil tank. Change oil immediately if oil level begins to rise.

**E Emission Control System Service
(California).**





POLARIS LUBRICANTS, MAINTENANCE AND SERVICE PRODUCTS

Part No.	Description
Engine Lubricant	
2870791	Fogging Oil (12 oz. Aerosol)
2871098	Premium 2 Cycle Engine Oil (Quart) (12 Count)
2871281	Engine Oil (Quart) Premium 4 Synthetic 0W-40 (4-Cycle) (12 Count)
2871844	Engine Oil (Gallon) Premium 4 Synthetic 0W-40 (4-Cycle) (4 Count)
2871567	Engine Oil (16 Gallon) Premium 4 Synthetic 0W-40 (4-Cycle)
Gearcase / Transmission Lubricants	
2873603	Premium Synthetic Gearcase Lubricant (1 Gal.) (4 Count)
2873602	Premium Synthetic Gearcase Lubricant (12 oz. bottle) (12 Count)
2871653	Premium Front Gearcase Fluid (8 oz.) (12 Count)
2871653	Premium Front Gearcase Fluid (2.5 Gal) (2 Count)
2870465	Oil Pump for 1 Gallon Jug
2871654	Premium Drive Hub Fluid (8 oz.) (12 Count)
2872277	Premium Drive Hub Fluid (2.5 gal.) (2 Count)
2871653	Angle Drive Fluid (8 oz.)
Grease / Specialized Lubricants	
2871322	Premium All Season Grease (3 oz. cartridge) (24 Count)
2871423	Premium All Season Grease (14 oz. cartridge) (10 Count)
2871460	Starter Drive Grease (12 Count)
2871515	Premium U-Joint Lube (3 oz.) (24 Count)
2871551	Premium U-Joint Lube (14 oz.) (10 Count)
2871312	Grease Gun Kit
2871329	Dielectric Grease (Nyogel™)
Coolant	
2871323	60/40 Coolant (Gallon) (6 Count)
2871534	60/40 Coolant (Quart) (12 Count)
Additives / Sealants / Thread Locking Agents / Misc.	
2870585	Loctite™ Primer N, Aerosol, 25 g
2871956	Loctite™ Thread Sealant 565 (50 ml.) (6 Count)
2871949	Loctite™ Threadlock 242 (50 ml.) (10 Count)
2871950	Loctite™ Threadlock 242 (6 ml.) (12 Count)
2871951	Loctite™ Threadlock 262 (50 ml.) (10 Count)
2871952	Loctite™ Threadlock 262 (6 ml.) (12 Count)
2871953	Loctite™ Threadlock 271 (6 ml.) (12 Count)

Part No.	Description
2871954	Loctite™ Threadlock 271 (36 ml.) (6 Count)
2870584	Loctite™ 680-Retaining Compound (10 ml.)
2870587	Loctite™ 518 Gasket Eliminator / Flange Sealant (50 ml.) (10 Count)
2872113	Disk Brake Quiet (12 oz.) (12 Count)
2871326	Premium Carbon Clean (12 oz.) (12 Count)
2870652	Fuel Stabilizer (16 oz.) (12 Count)
2871957	Black RTV Silicone Sealer (3 oz. tube) (12 Count)
2871958	Black RTV Silicone Sealer (11 oz. cartridge) (12 Count)
2870990	DOT3 Brake Fluid (12 Count)
2872113	Disc Brake Quiet, Aerosol, (9 oz.) (12 Count)
2871557	Crankcase Sealant, 3-Bond 1215 (5oz.)
2872893	Engine Degreaser (12oz.) (12 Count)

NOTE: The number count indicated by each part number in the table above indicates the number of units that are shipped with each order.

NOTE: Each item can be purchased separately at your local Polaris dealer.



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION	CHAPTER TOOL USED IN
PA-44689	Valve Clutch Adjuster	2
2872105	Water Pump Mechanical Seal Puller	2
8712100 or 8712500	Tachometer	2,10
2200634	Valve Seat Reconditioning Kit	3
2870390	Piston Support Block	3
2871043	Flywheel Puller	3
2871283	Crankshaft/Water Pump Seal Install Kit	3
5131135	Water Pump Install Kit	3
2870569	Crankshaft Truing Stand	5
2872314	Carburetor Float Adjustment Tool	4
2870975	Mity Vac™ Pressure Test Tool	3, 4, 9
2870871	Ball Joint Replacement Tool	5
2870872	Shock Spanner Wrench	2, 5
2870623	Shock Absorber Spring Compression Tool	5
2871572	Strut Rod Wrench	5
2871573	LH Strut Spring Compressor	5
2871574	RH Strut Spring Compressor	5
2870506	Clutch Puller	6
9314177	Clutch Holding Wrench	6
2871358	Clutch Holding Fixture	6
2870341	Drive Clutch Spider Removal and Install Tool	6
2870654	Clutch Offset Alignment Tool	6
2870913	Driven Clutch Puller	6
2870910	Roller Pin Tool	6
2871226	Clutch Bushing Replacement Tool Kit	6
2870386	Piston Pin Puller	6
8700220	Clutch Compression Tool	6
2871025	Clutch Bushing Replacement Tool Kit	6
2872608	Roller Pin Removal Tool	7
8700226	CV Boot Clamp Pliers	7
PV-43568	Fluke™ 77 Digital Multimeter	10
2870630	Timing Light	10
2870836	Battery Hydrometer	10

PRE-RIDE / DAILY INSPECTION

Perform the following pre-ride inspection daily, and when servicing the vehicle at each scheduled maintenance.

- Tires - check condition and pressures
- Fuel and oil tanks - fill both tanks to their proper level; Do not overfill oil tank
- All brakes - check operation and adjustment (includes auxiliary brake)
- Throttle - check for free operation and closing
- Headlight/Taillight/Brakelight - check operation of all indicator lights and switches
- Engine stop switch - check for proper function
- Wheels - check for tightness of wheel nuts and axle nuts; check to be sure axle nuts are secured by cotter pins
- Air cleaner element - check for dirt; clean or replace
- Steering - check for free operation noting any unusual looseness in any area
- Loose parts - visually inspect vehicle for any damaged or loose nuts, bolts or fasteners
- Engine coolant - check for proper level at the recovery bottle



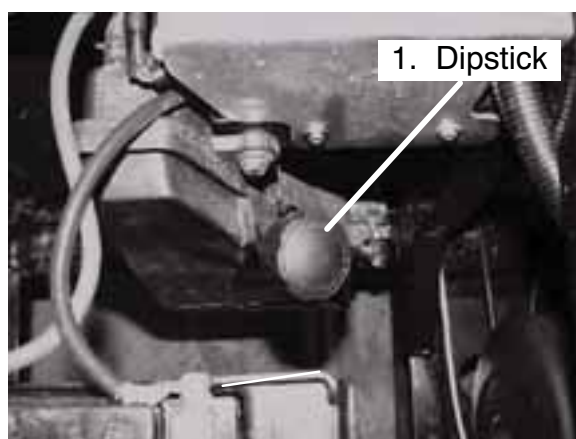
LUBRICATION

Item	Lube Rec.	Method	Frequency*
1. Engine Oil 4-Stroke	Polaris 0W-40 Synthetic (PN 2871281)	Add oil to proper level.	Change after 1st month, 6 months or 100 hours thereafter; Change more often (25-50 hours) in extremely dirty conditions, or short trip cold weather operation.
2. Transmission	Polaris Synthet- ic Gear Case Lubricant (PN 2871477)	Add lube to bottom of fill plug threads.	Change annually. Change more often if used in severe conditions.
3. Brake Fluid	DOT 3 (PN 2870990) or Dot 4	Fill reservoir between MAX and Min lines.	As required. Change fluid every 2 years.



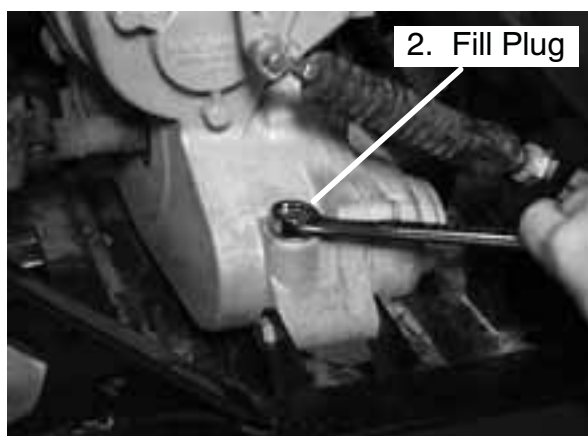
1. Oil Filter

Engine Oil and Filter



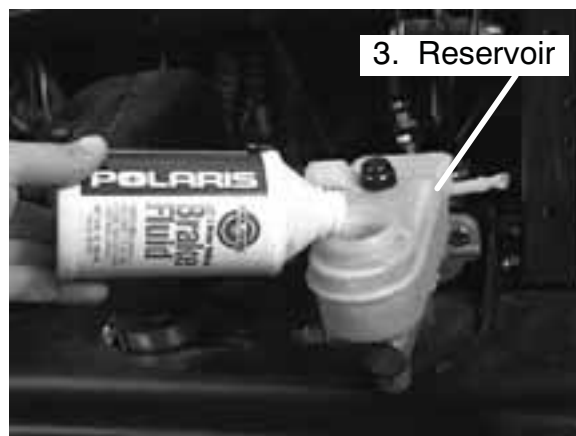
1. Dipstick

Engine Oil Tank



2. Fill Plug

Transmission



3. Reservoir

Brake Master Cylinder

* More often under severe use, such as operated in water or under severe loads.

- ① Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)
- ② Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)
- ③ Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilgrease Special



LUBRICATION, CONT.

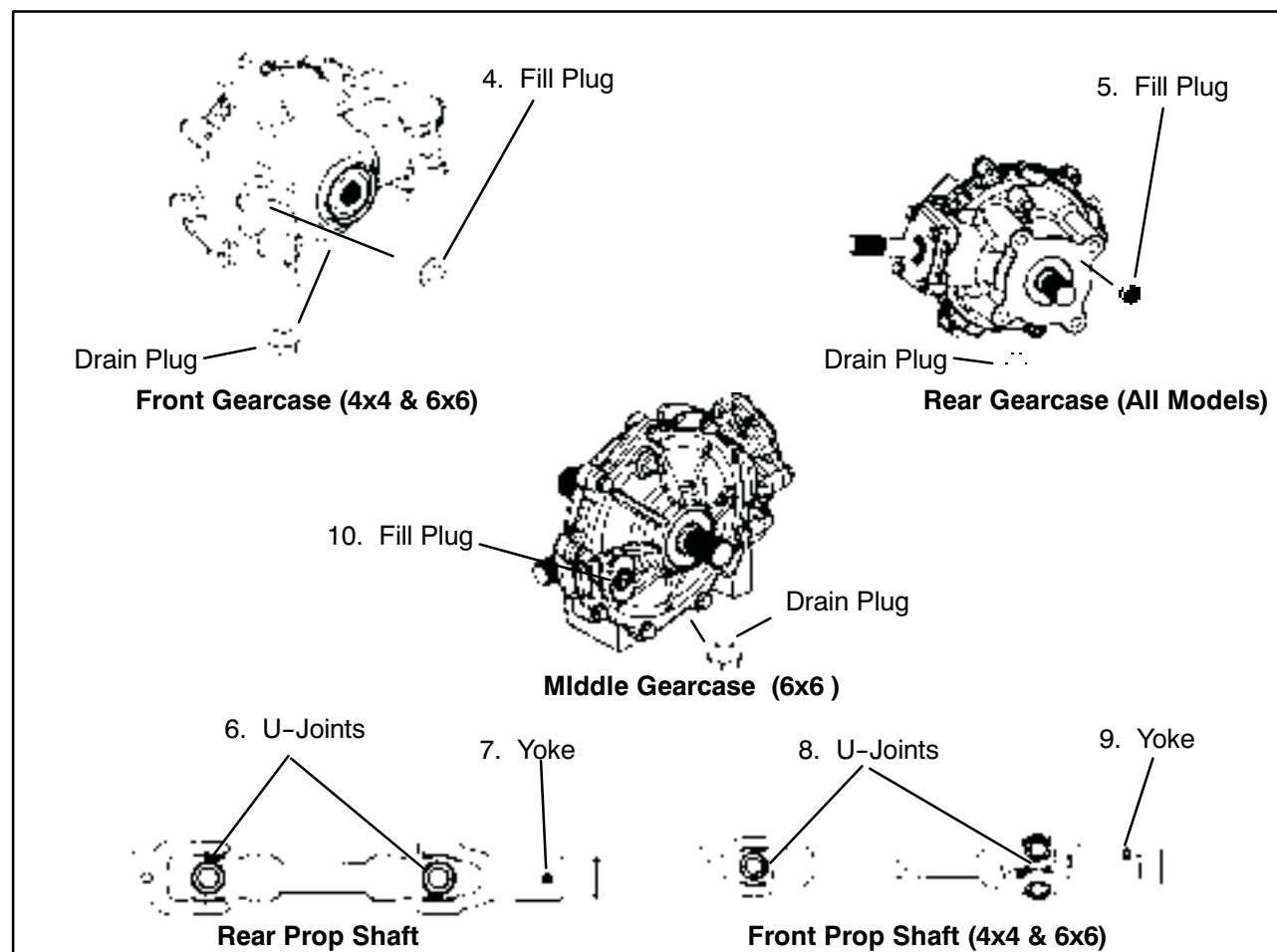
Item	Lube Rec.	Method	Frequency*
4. Front Gearcase	Polaris Demand Drive Hub Fluid (PN 2871654)	Drain completely. Add lube to specified quantity.	Change annually ²
5. Rear Gearcase	Polaris Gear Drive Fluid (PN 2871477)	Drain completely. Add lube to specified quantity.	Change annually ²
6. Rear Prop Shaft U-Joints	Polaris Premium U-Joint Lube (PN 2871551)	Locate fittings and grease and grease with grease gun.	Semi-annually ¹
7. Rear Prop Shaft Yoke	Polaris Premium U-Joint Lube (PN 2871551)	Locate fittings and grease with grease gun.	Semi-annually ¹
8. Front Prop Shaft U-Joints	Polaris Premium U-Joint Lube (PN 2871551)	Locate fittings and grease with grease gun.	Semi-annually ¹
9. Front Prop Shaft Yoke	Polaris Premium U-Joint Lube (PN 2871551)	Drain completely. Add lube to specified quantity.	Semi-annually ¹
10. Middle Gearcase	Polaris Gear Drive Fluid (PN 2871477)	Polaris Gear Drive Fluid	Semi-annually ¹

* More often under severe use, such as operated in water or under severe loads.

¹ Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)

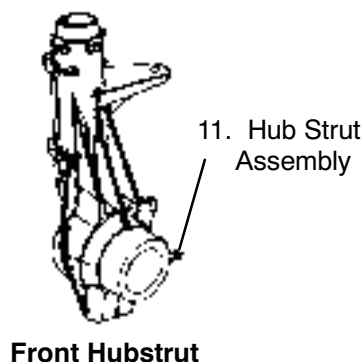
² Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)

³ Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special





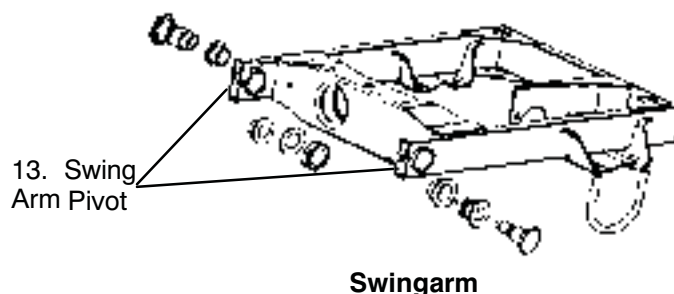
LUBRICATION, CONT.



12. Mid Axle Drive Shaft



Mid Angle Driveshaft (6x6)



Item	Lube Rec.	Method	Frequency*
11. Hubstrut Assembly (Both Sides)	Polaris All Season Grease (PN 2871423)	Locate grease fitting on the underside of the hub-strut assembly and grease with grease gun.	Semi Annually ¹
12. Mid Axle Drive Shaft (Both Driveshafts) (6x6)	Polaris All Season Grease (PN 2871423)	Locate grease two grease fittings on both ends joints of driveshaft and grease with grease gun. Locate grease fitting in center of driveshaft and grease with grease gun.	Semi Annually ¹
13. Swing Arm Pivot	Polaris All Season Grease (PN 2871423)	Locate grease fitting on inside of the swing arm pivot.	Semi Annually ¹

* More often under severe use, such as operated in water or under severe loads.

¹ Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)

² Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)

³ Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special



FRONT GEARCASE **LUBRICATION (4X4, 6X6** **MODELS ONLY)**

FRONT GEARCASE SPECIFICATIONS

Specified Lubricant:

Premium Demand Drive Hub Fluid
(PN 2871654)

Capacity: 5.0 Oz. (150 ml.)

Drain Plug / Fill Plug Torque:

14 ft. lbs. (19.4 Nm)

The gearcase lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is level before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct front gearcase lubricant to use is Polaris Premium Demand Hub Fluid.

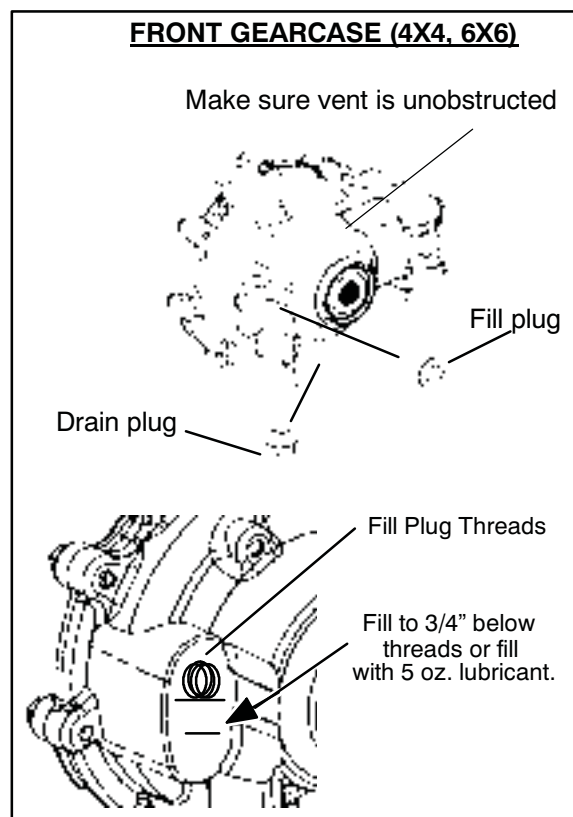
To check the lubricant level:

The gearcase must be drained and re-filled with the proper amount of lubricant. Refer to the procedure below.

To change front gearcase lubricant:

1. With the *RANGER* on a level surface, remove the fill plug and check the lubricant level. Lubricant should be kept at the specified level, according to the proper gearcase specifications listed.
2. Support the vehicle securely with a jackstand and remove the front tire on the driver's side.
3. Remove gearcase drain plug located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
4. Clean and reinstall drain plug using a new sealing washer.
5. Remove fill plug.
6. Fill with the recommended fluid amount or fill to 0.75 in. (19 mm) below the threads of the fill plug.

7. Install fill plug. Check for leaks.



MIDDLE GEARCASE **LUBRICATION (6X6 ONLY)**

MIDDLE GEARCASE SPECIFICATIONS

Specified Lubricant:

Polaris Gear Drive Fluid (PN 2871653)

Capacity: 6.75 Oz. (200 ml.)

Drain Plug / Fill Plug Torque:

14 ft. lbs. (19.4 Nm)

The gearcase lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is level before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct middle gearcase lubricant to use is Polaris Gear Drive Fluid

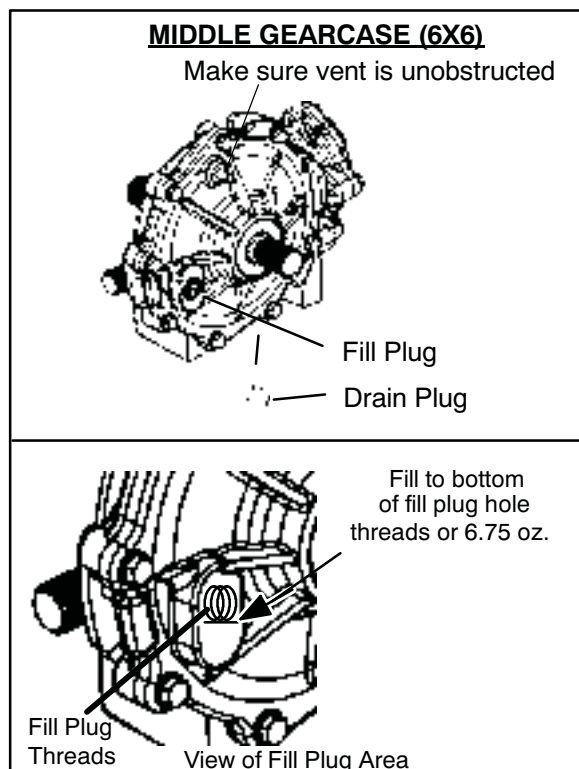


To check the lubricant level:

The gearcase must be drained and re-filled with the proper amount of lubricant. Refer to the procedure below.

To change middle gearcase lubricant:

1. With the *RANGER* on a level surface, remove the fill plug and check the lubricant level. Lubricant should be kept at the specified level, according to the proper gearcase specifications listed.
2. Support the vehicle securely with a jackstand and remove the front tire on the driver's side.
3. Remove gearcase drain plug located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
4. Clean and reinstall drain plug using a new sealing washer.
5. Remove fill plug.
6. Fill with the recommended fluid amount or fill to the bottom of the threads of the fill plug hole.
7. Install fill plug. Check for leaks.



REAR GEARCASE LUBRICATION (ALL MODELS)

REAR GEARCASE SPECIFICATIONS

Specified Lubricant:

Polaris Gear Drive Fluid (PN 2871653)

Capacity: 10 Oz. (300 ml.)

Drain Plug / Fill Plug Torque:

14 ft. lbs. (19.4 Nm)

The gearcase lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is level before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct rear gearcase lubricant to use is Polaris Gear Drive Lube

To check the lubricant level:

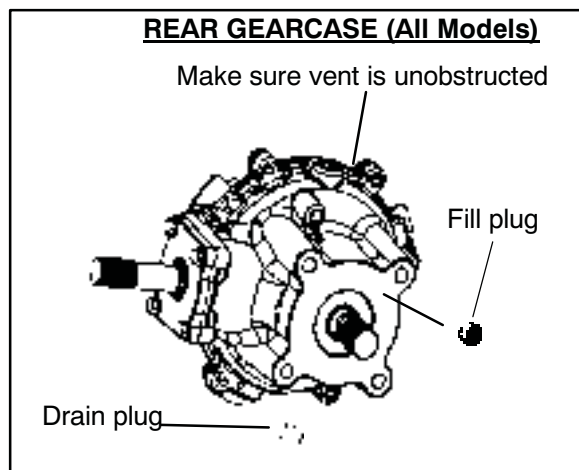
The gearcase must be drained and re-filled with the proper amount of lubricant. Refer to the procedure below.

To change rear gearcase lubricant:

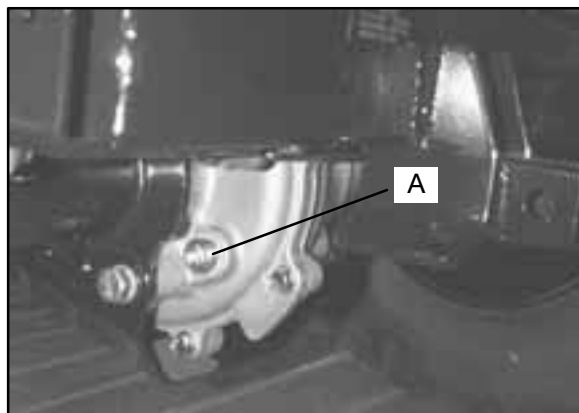
1. With the vehicle on a level surface, remove the fill plug and check the lubricant level. Lubricant should be kept at the specified level, according to the proper gearcase specifications listed.
2. Support the vehicle securely with a jackstand and remove the front tire on the driver's side.
3. Remove gearcase drain plug located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.



4. Clean and reinstall drain plug using a new sealing washer.



5. Remove fill plug (A).



6. Fill with the recommended fluid amount or fill to the bottom of the threads of the fill plug hole.
7. Install fill plug. Check for leaks.

TRANSMISSION LUBRICATION

NOTE: It is very important to follow a regular transmission fluid check/change schedule. The service manual of the RANGER recommends the level be **checked every twenty-five (25) hours** of operation, and **changed once (1) a year**.

TRANSMISSION SPECIFICATIONS

Specified Lubricant:

Polaris Premium Synthetic Gearcase Lubricant
(PN 2871477) (Gallon) (PN 2871478) (12 oz.)

Approximate Capacity at Change:

4x4 & 6x6: 13.50 oz. (400 ml.)

2x4: 27 oz. (800 ml.)

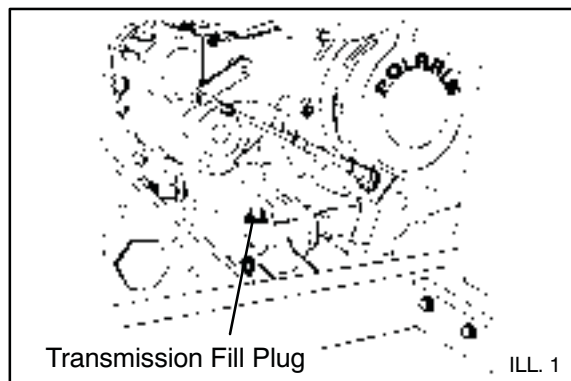
Drain Plug Torque: 14 ft. lbs. (19.4 Nm)

The transmission lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is level before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.

To check the level:

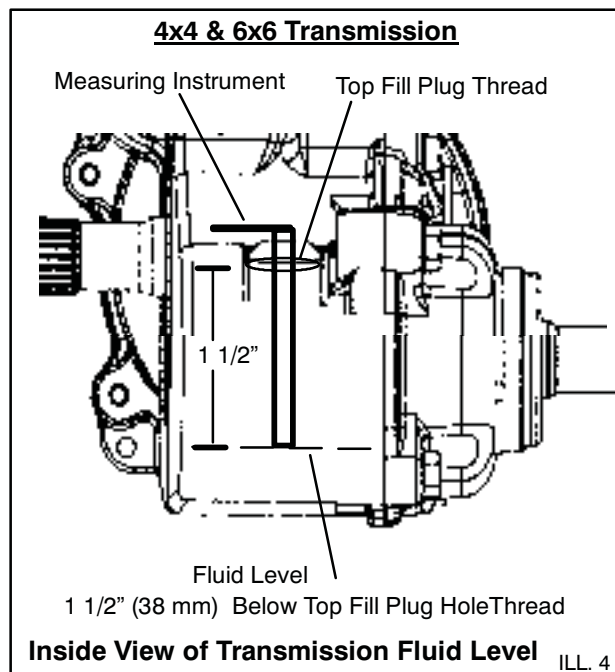
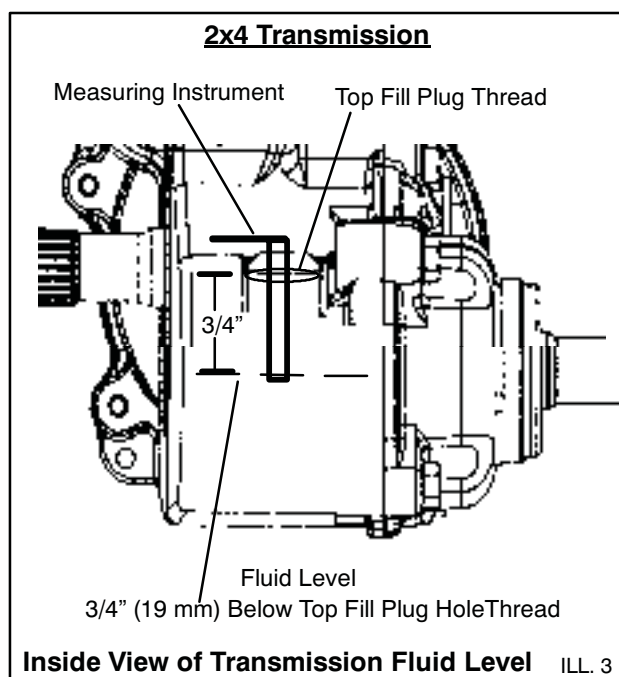
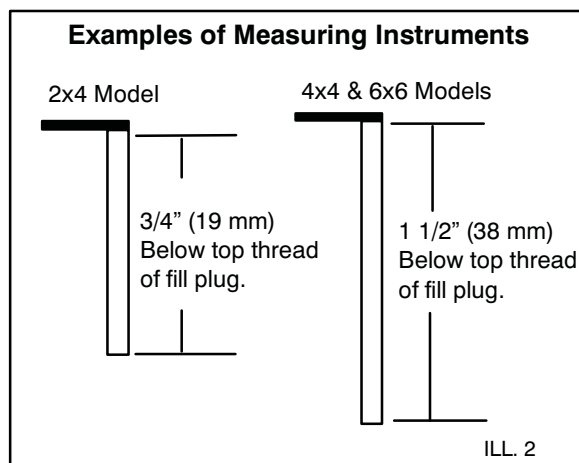
1. Remove transmission plug and wipe clean.



2. To check the level, use a light colored and non absorbent measuring instrument (Exp: white zip tie). The fluid level of the **2x4** models is **3/4" (19 mm)** below the top thread of the fill plug. The **4x4 and 6x6** models should measure **1 1/2" (38 mm)** below the top thread of the fill plug. See ILL. 2 on next page.

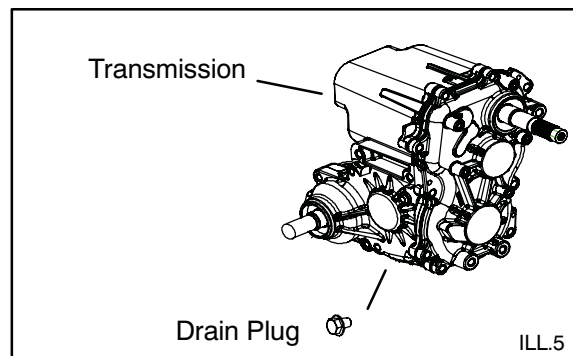
Simply modify the measuring instrument to the specified distance. Dip the measuring instrument into the gearcase, the fluid level should just touch the bottom portion of the measuring instrument. Fill or drain the transmission until the specified quantities are reached. See ILL. 3 and ILL. 4.





To change lubricant:

1. Remove skid plate (if necessary).
2. Place a drain pan beneath the transmission oil drain plug area.
3. Remove the drain plug and wipe the magnetic end clean to remove accumulated metallic filings.



4. After the oil has drained completely, install a new sealing washer and install the drain plug. Torque to 14 ft. lbs. (19 Nm).
5. Add the proper lubricant through the dipstick hole until the oil level is between the upper and lower limits. Do not overfill. Refer to Illustration 2 for proper fluid level depending on the *RANGER* model.
6. Check for leaks.
7. Reinstall skid plate if removed in Step 1.



SHIFT LINKAGE INSPECTION/ADJUSTMENT

Linkage rod adjustment is necessary when symptoms include:

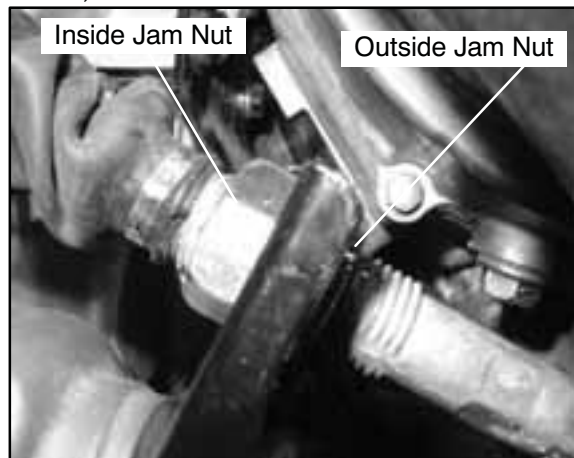
- No All Wheel Drive light
- Noise on deceleration
- Inability to engage a gear
- Excessive gear clash (noise)
- Shift selectors moving out of desired range

NOTE: Remove necessary components to gain access to shift linkage cable ends (i.e. exhaust heat shield, exhaust pipe, etc.).



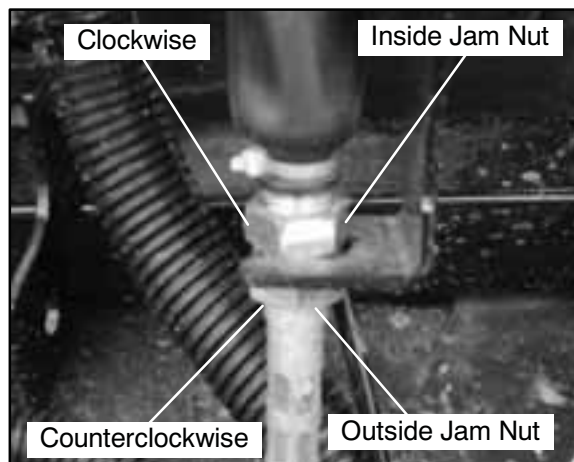
1. Inspect shift linkage cable, clevis pins, and pivot bushings and replace if worn or damaged.
2. Be sure idle speed is adjusted properly.
3. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.
4. With two wrenches loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns. Perform this procedure on the shift lever

end, also.



Transmission Cable Adjustment

5. After turning the outside jam nut 1 1/2 turns. Hold the outside jam nut with a wrench and tighten the inside jam nut clockwise, until it is tight against the bracket.
6. Repeat Step 4 and Step 5 until the proper adjustment is made for the transmission cable.
7. Use this procedure to loosen or tighten the shift linkage cable as needed.

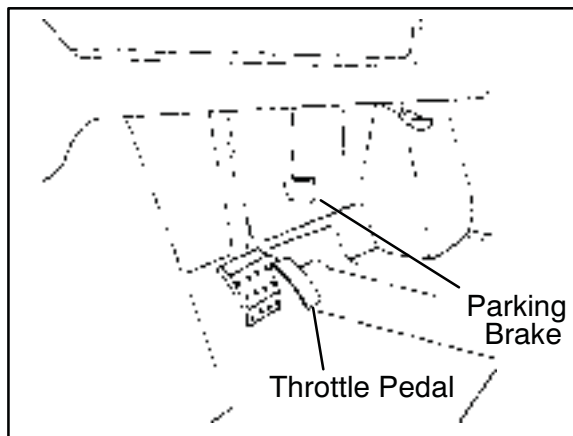


Shift Lever Cable Adjustment



THROTTLE PEDAL INSPECTION

Throttle Freeplay



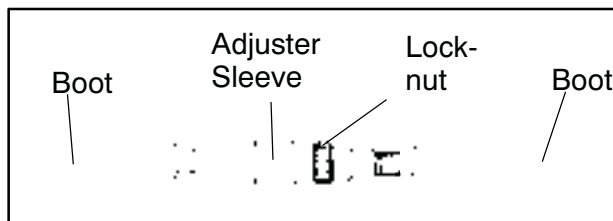
If the throttle pedal has excessive play due to cable stretch or cable misadjustment, it will cause a delay in throttle speed. Also, the throttle may not open fully. If the throttle pedal has no play, the throttle may be hard to control, and the idle speed may be erratic. Check the throttle pedal play periodically in accordance with the Periodic Maintenance Chart and adjust the play if necessary.

Throttle Freeplay Inspection

1. Apply the parking brake.
2. Put the gear shift lever in the N (Neutral) position.
3. Start the engine, and warm it up thoroughly.
4. Measure the distance the throttle pedal moves before the engine begins to pick up speed. Free play should be 1/16 - 1/8 inches.

Adjustment

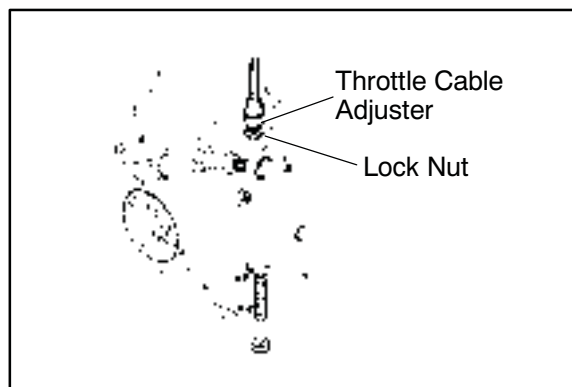
1. Slide the bolts off inline cable adjuster sleeve. Loosen adjuster locknut.
2. Turn adjuster until 1/16, to 1/8, freeplay is achieved pedal. **NOTE:** While adjusting freeplay, it is important you flip the throttle lever back and forth.
3. Tighten locknut and slide boots over cable adjuster until they touch at the mid point of adjuster.



THROTTLE CABLE ADJUSTMENT

NOTE: If the proper freeplay cannot be obtained with the throttle block adjuster, adjust the cable at the carburetor using the following procedure.

1. Remove seat.
2. Slide boot off throttle cable adjuster and jam nut.
3. Loosen lock nut and turn adjuster until proper throttle lever freeplay is obtained.
4. Tighten locknut and slide boot back over adjuster.
5. Reinstall seat.
6. Check for proper throttle operation and correct freeplay in all handlebar positions.

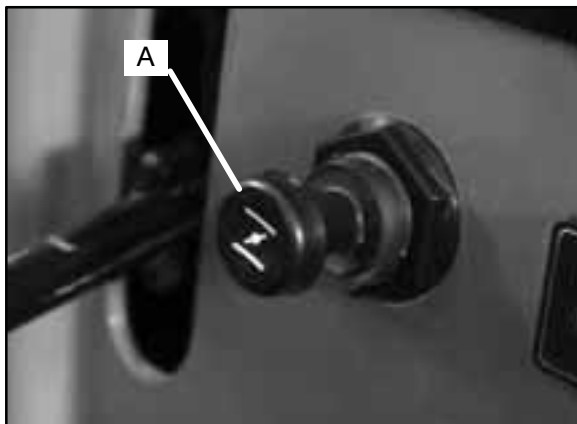


CHOKE (ENRICHER) ADJUSTMENT

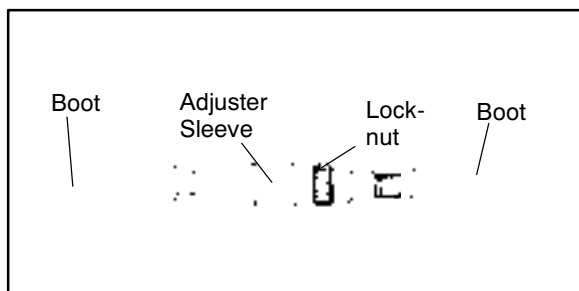
With the choke control pushed in, the choke plunger must be seated on the fuel passage way in the carburetor. If the plunger is not seated on the fuel passage way inside the carburetor (not enough cable freeplay), the engine will flood or run too rich, causing plug fouling and poor performance.



If cable slack is excessive, the choke fuel passage will not open far enough, which may cause cold starting difficulty. Also, the half-choke position used for intermittent applications will not function properly.



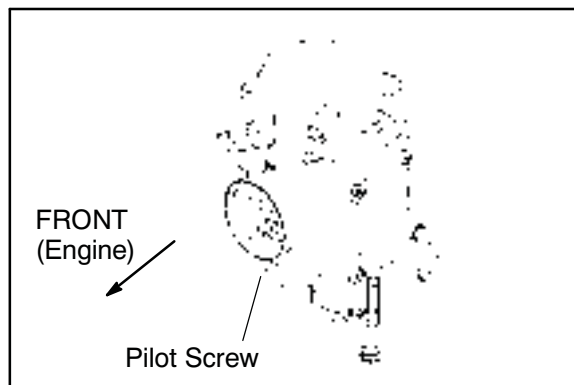
1. Locate the boot by the carburetor and pull it back. Loosen the friction nut 1 turn or until choke slides freely. Re-install boot.
2. Push the choke knob (A) in to the full off position.
3. Slide boots off in-line cable adjuster and loosen adjustment locknut.
4. Turn adjuster until the choke knob pulls out over 1/4".
5. Push on the choke knob lightly while turning the adjuster the opposite way.



6. Turn the adjuster until the knob contacts the boot.
7. Tighten adjuster nut.
8. Slide boots back over cable adjuster sleeve until they touch at the middle point of the adjuster.
9. Pull back the choke knob boot and tighten the friction nut until the choke will maintain a set position. Re-install boot.

PILOT SCREW ADJUSTMENT

1. Start engine and warm it up to operating temperature (about 10 minutes).



Pilot Screw Adjustment

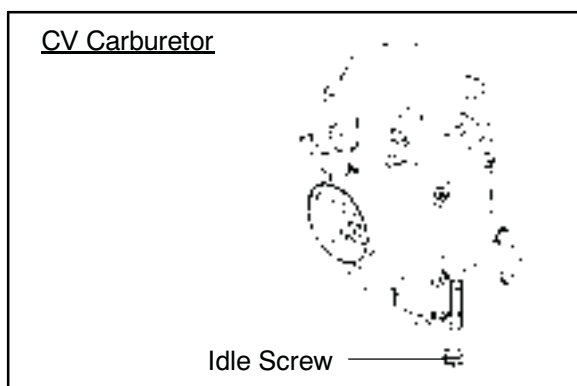
Refer to Specifications

2. Turn pilot screw in (clockwise) until *lightly* seated. Turn screw out the specified number of turns.
NOTE: Do not tighten the pilot screw forcefully against the seat or the screw and/or seat will be permanently damaged.
3. Connect an accurate tachometer that will read in increments of + or - 50 RPM such as the PET 2100DX (PN 8712100DX) or the PET 2500 (PN 8712500).
4. Set idle speed to 1200 RPM. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.
5. Slowly turn mixture screw clockwise using the pilot screw wrench until engine begins to miss.
6. Slowly turn mixture screw counterclockwise until idlespeed increases to maximum RPM. Continue turning counterclockwise until idle RPM begins to drop.
7. Center the pilot screw between the points in step 5 and 6.
8. Re adjust idle speed if not within specification.



IDLE SPEED ADJUSTMENT

1. Start engine and warm it up thoroughly.



Idle Speed:

1200 +/- 200 RPM

2. Adjust idle speed by turning the idle adjustment screw in (clockwise) to increase or out (counterclockwise) to decrease RPM. (Refer to Ill. at right).

NOTE: Adjusting the idle speed affects throttle cable freeplay. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

FUEL SYSTEM

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

- Always stop the engine and refuel outdoors or in a well ventilated area.
- Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- Do not overfill the tank. Do not fill the tank neck.
- If you get gasoline in your eyes or if you swallow gasoline, seek medical attention immediately.
- If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

- Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can result loss of consciousness or death in a short time.
- Never drain the float bowl when the engine is hot. Severe burns may result.

FUEL LINES

1. Check fuel lines for signs of wear, deterioration, damage or leakage. Replace if necessary.
2. Be sure fuel lines are routed properly and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched.
3. Replace all fuel lines every two years.

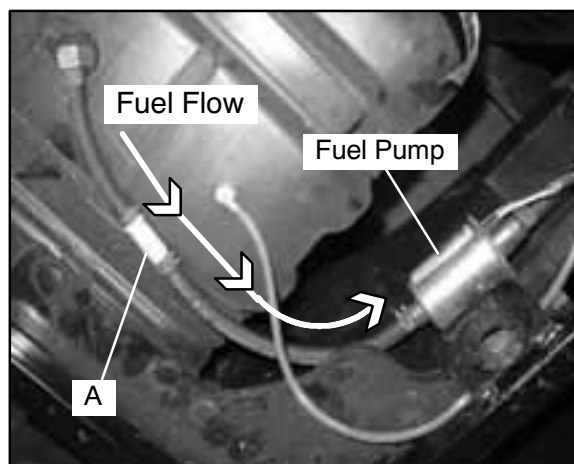
VENT LINES

1. Check fuel tank, oil tank, carburetor, battery and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
2. Be sure vent lines are routed properly and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched.

FUEL FILTER

The fuel filter should be replaced in accordance with the Periodic Maintenance Chart or whenever sediment is visible in the filter.

1. Remove line clamps at both ends of the filter (A).
2. Remove fuel lines from filter (A).



3. Install new filter and clamps onto fuel lines with arrow pointed in direction of fuel flow.
4. Install clamps on fuel line.



5. Start engine and inspect for leaks.

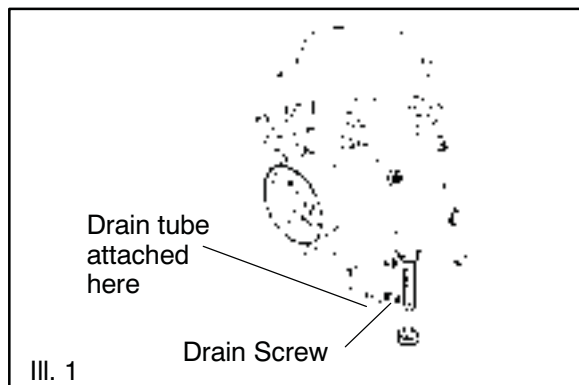
CARBURETOR DRAINING

The carburetor float bowl should be drained periodically to remove moisture or sediment from the bowl, or before extended periods of storage.

NOTE: The bowl drain screw is located on the bottom left side of the float bowl.

1. Turn fuel valve to the off position.
2. Place a clean container beneath the bowl drain spigot or bowl drain hose.
3. Turn drain screw out two turns and allow fuel in the float bowl and fuel line to drain completely.
4. Inspect the drained fuel for water or sediment.
5. Tighten drain screw.
6. Turn fuel valve to "ON".
7. Start machine and check for leaks.

NOTE: All tubes attached to the carburetor must be checked for pinching or blockage, as this will effect engine performance.



BATTERY MAINTENANCE

! WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

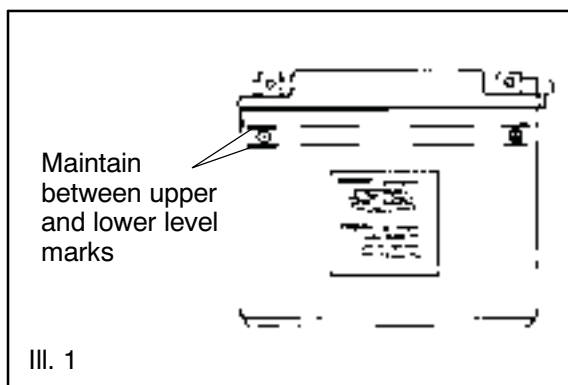
Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

NOTE: New Batteries: Batteries must be fully charged before use or battery life will be reduced by 10-30% of full potential. Charge battery for 3-5 hours at a current equivalent of 1/10 of the battery's rated amp/hour capacity. Do not use the alternator to charge a new battery. (Refer to Battery Activation and Maintenance video PN 9917987)

The battery is located under the left rear fender.

Inspect the battery fluid level. When the electrolyte nears the lower level, remove the battery and **add distilled water only** to the upper level line. (III.1)





To remove the battery:

1. Disconnect holder strap and remove cover.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



CAUTION

To reduce the chance of sparks: Whenever removing the battery, disconnect the negative (black) cable first. When reinstalling the battery, install the negative cable last.

3. Disconnect the vent hose.
4. Remove the battery.
5. Remove the filler caps and add *distilled water only* as needed to bring each cell to the proper level. Do not overfill the battery. Fully recharge after filling.



Use only distilled water. Tap water contains minerals which are harmful to a battery.



Do not allow cleaning solution or tap water to enter the battery, as it will shorten the life of the battery.

6. Reinstall the battery caps.
7. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
8. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable.
9. Reattach vent hose making sure it is properly routed and not kinked or pinched.
10. Coat terminals and bolt threads with Dielectric Grease (PN 2871329).
11. Reinstall battery cover and holder strap.

SPARK PLUG

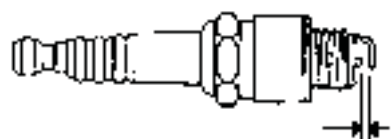
1. Remove spark plug high tension lead. Clean plug area so no dirt and debris can fall into engine when plug is removed.
2. Remove spark plug.
3. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.
4. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.
5. Measure gap with a wire gauge. Refer to specifications for proper spark plug type and gap. Adjust gap if necessary by bending the side electrode carefully. (Ill. 1)
6. If necessary, replace spark plug with proper type. **CAUTION:** Severe engine damage may occur if the incorrect spark plug is used.
7. Apply a small amount of anti-seize compound to the spark plug threads.
8. Install spark plug and torque to specification.

Recommended Spark Plug:

Refer to Specifications

Spark Plug Torque:
14 Ft. Lbs. (19 Nm)

Spark Plug Gap



.036" (0.9 mm)

IGNITION TIMING

Refer to Chapter 10 for ignition timing procedures.

Ignition Timing 425/500 Engines:

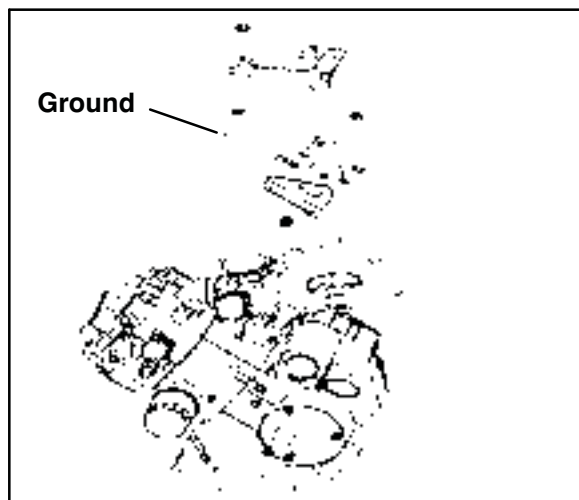
30°±2° BTDC@5000RPM





ENGINE TO FRAM GROUND

Inspect engine-to-frame ground cable connection. Be sure it is clean and tight.



LIQUID COOLING SYSTEM OVERVIEW

The engine coolant level is controlled or maintained by the recovery system. The recovery system components are the recovery bottle, radiator filler neck, radiator pressure cap and connecting hose.

As coolant operating temperature increases, the expanding (heated) excess coolant is forced out of the radiator past the pressure cap and into the recovery bottle. As engine coolant temperature decreases the contracting (cooled) coolant is drawn back up from the tank past the pressure cap and into the radiator.

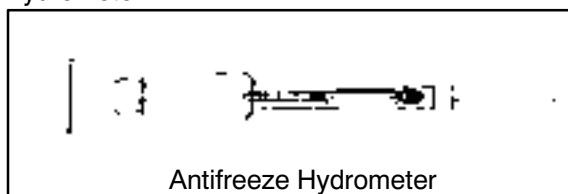
Some coolant level drop on new machines is normal as the system is purging itself of trapped air. Observe coolant levels often during the break-in period.

Overheating of engine could occur if air is not fully purged from system.

Polaris Premium 60/40 is already premixed and ready to use. Do not dilute with water.

COOLANT STRENGTH / TYPE

Test the strength of the coolant using an antifreeze hydrometer.



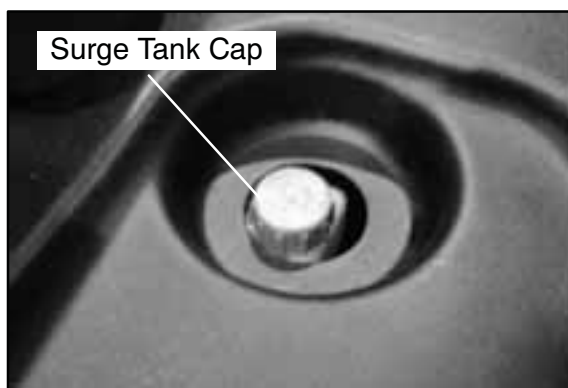
- A 50/50 or 60/40 mixture of antifreeze and distilled water will provide the optimum cooling, corrosion protection, and antifreeze protection.
- Do not use tap water, straight antifreeze, or straight water in the system. Tap water contains minerals and impurities which build up in the system.
- Straight water or antifreeze may cause the system to freeze, corrode, or overheat.

Polaris 60/40 Anti-Freeze / Coolant

(PN 2871323)

COOLANT LEVEL INSPECTION

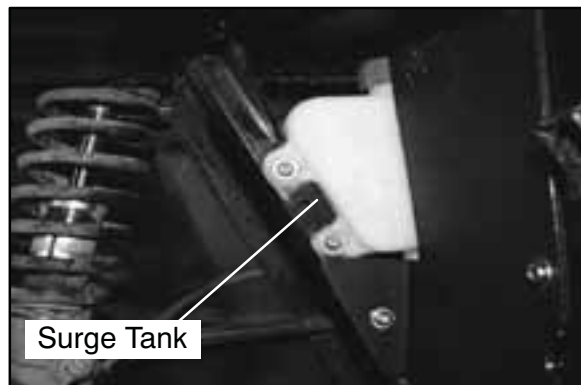
The recovery bottle, located on the left side of the machine, must be maintained between the minimum and maximum levels indicated on the recovery bottle.



With the engine at operating temperature, the coolant level should be between the upper and lower marks on the coolant reservoir. If not:



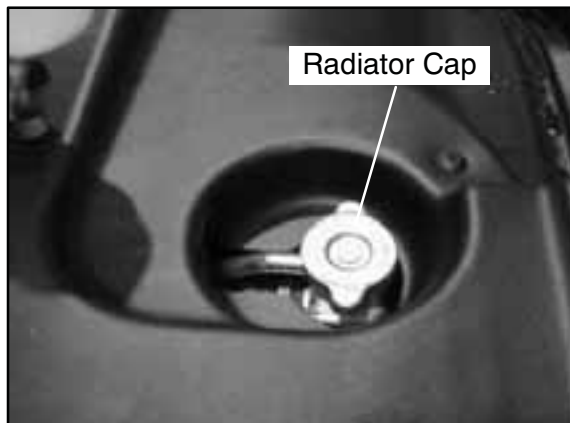
1. Remove reservoir cap. Inner splash cap vent hole must be clear and open.
2. Fill reservoir to upper mark with Polaris Premium 60/40 Anti Freeze / Coolant or 50/50 or 60/40 mixture of antifreeze and distilled water as required for freeze protection in your area.
3. Reinstall cap.



NOTE: If overheating is evident, allow system to cool completely and check coolant level in the radiator and inspect for signs of trapped air in system.

RADIATOR COOLANT LEVEL INSPECTION

NOTE: This procedure is only required if the cooling system has been drained for maintenance and/or repair. However, if the recovery bottle has run dry, or if overheating is evident, the level in the radiator should be inspected and coolant added if necessary.



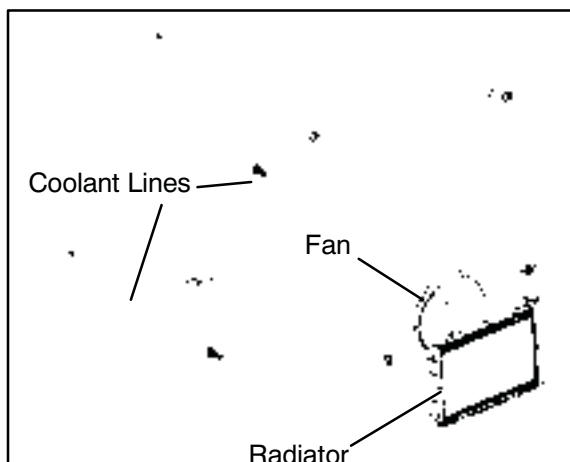
WARNING Never remove the pressure cap when the engine is warm or hot. Escaping steam can cause severe burns. The engine must be cool before removing the pressure cap.

NOTE: Use of a non-standard pressure cap will not allow the recovery system to function properly.

To access the radiator pressure cap raise the front hood.

The radiator cap is located on the drivers side.

COOLING SYSTEM HOSES



1. Inspect all hoses for cracks, deterioration, abrasion or leaks. Replace if necessary.
2. Check tightness of all hose clamps.



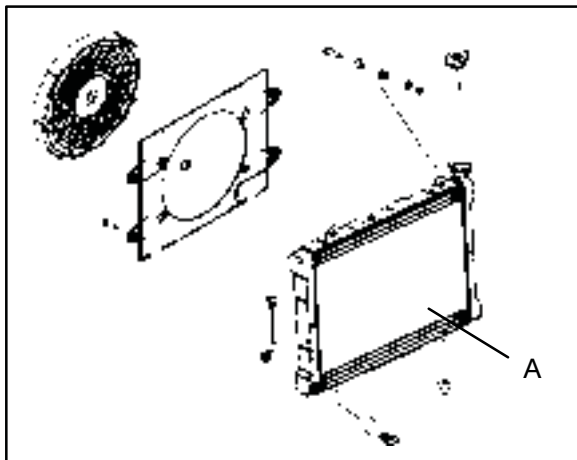
CAUTION:

Do not over-tighten hose clamps at radiator, or radiator fitting may distort, causing a restriction to coolant flow. Radiator hose clamp torque is 36 in. lbs. (4 Nm).

COOLING SYSTEM PRESSURE TEST

Refer to Page 3.5 for pressure test procedure.

RADIATOR

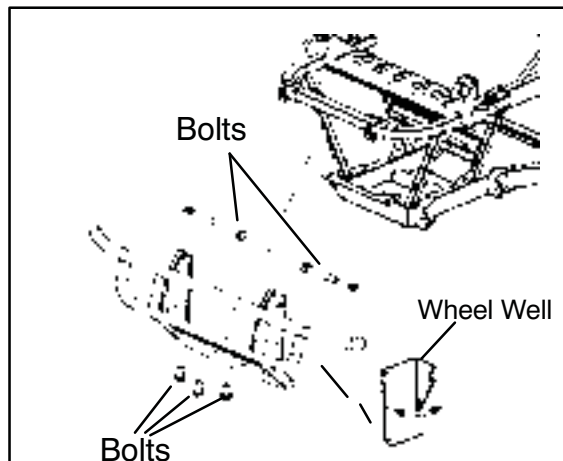


1. Check radiator (A) air passages for restrictions or damage.
2. Carefully straighten any bent radiator fins.
3. Remove any obstructions with compressed air or low pressure water.

COOLANT DRAIN/RADIATOR REMOVAL

1. Remove the front bumper. Remove three bolts that secure the bumper to the bottom of the frame. Remove six screws (both sides) that secure the wheel well panel to the frame. Remove two bolts that secure the top bumper to

the frame.



2. Remove two mounting screws that secure the top of the radiator to the frame. Remove the radiator cap. Pull the radiator out of the frame at an angle.

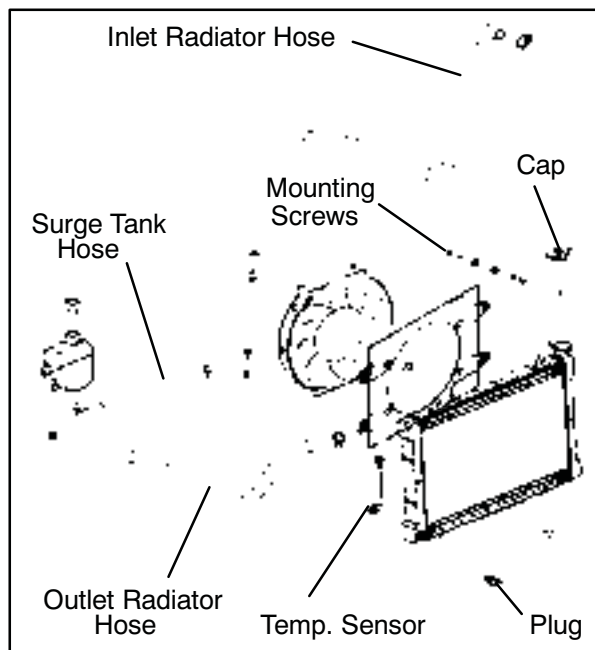
NOTE: If you have trouble reaching the top radiator bolts, remove four screws from the top front of the hood liner. Prop the front of the hood up 1.5 inches (38.10 mm) to help remove the top bolts that secure the radiator to the frame.

3. Remove the drain plug and drain the coolant from the radiator. Drain the coolant into a suitable container and properly dispose of the coolant.
4. Remove the outlet radiator hose, inlet radiator hose, surge tank hose, and overflow hose from the radiator.
5. Unplug the thermal sensor harness and the fan harness.





- Remove the radiator.

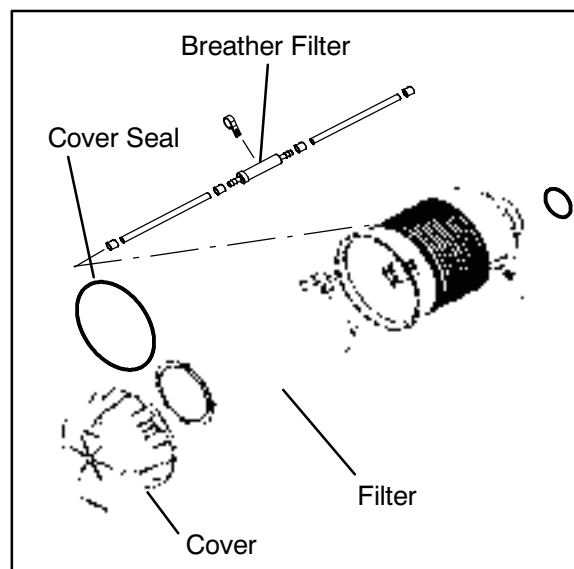


AIR FILTER/ BREATHER FILTER SERVICE

It is recommended that the air filter be replaced annually. When riding in extremely dusty conditions replacement will be required more often.

The filter should be inspected periodically before each ride, using the following procedure.

- Lift the box to access the filter box cover.
- Remove clips (2) from air box cover and remove cover. Inspect the gasket. It should adhere tightly to the cover and seal all the way around.
- Remove air filter assembly. Do not clean the main filter, the filter should be replaced.
- Inspect main element and replace if necessary. If the filter has been soaked with fuel or oil it must be replaced.



Installation

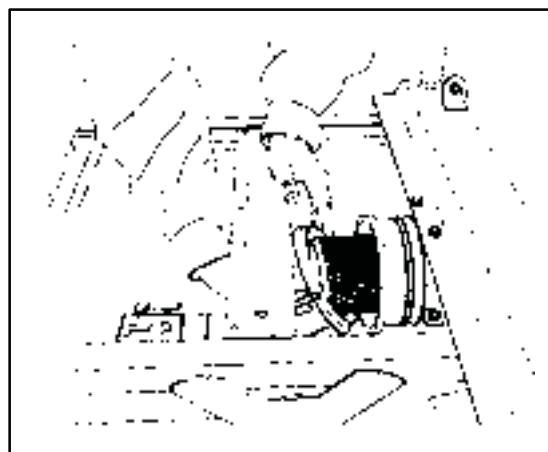
- Reinstall the filter into the air box container. Be sure the filter fits tightly in the air box.

NOTE: Apply a small amount of general purpose grease to the sealing edges of the filter before installing.

- Check air box. If oil or water deposits are found, drain them into a suitable container.

NOTE: Service more frequently if vehicle is operated in wet conditions or at high throttle openings for extended periods.

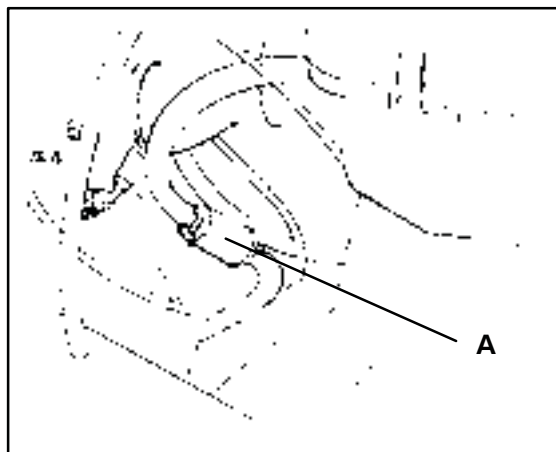
- Install air box cover and secure with clips.





BREATHER FILTER INSPECTION

The engines are equipped with a breather filter. The in-line filter is similar in appearance to a fuel filter, and is visible on the left side (Location A). Follow right hand breather line out of the side of the airbox and locate filter. Blow through gently in direction of arrow on filter to check for clogging. Replace as needed.



In-line breather filters should be installed with the arrow pointing toward the engine (away from the air box).

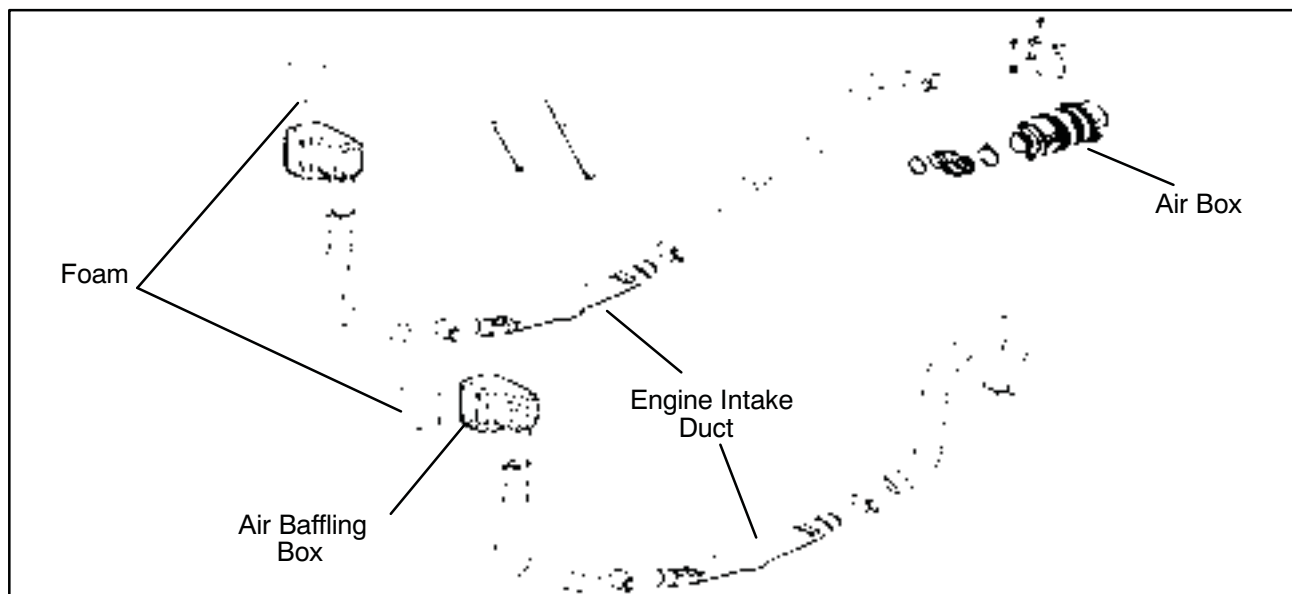
NOTE: In-line breather filter service life is extended when the foam air box pre-filter is in place and maintained properly. Never operate the engine without the pre-filter.

BREATHER HOSE

Be sure breather line is routed properly and secured in place. **CAUTION:** Make sure lines are not kinked or pinched.



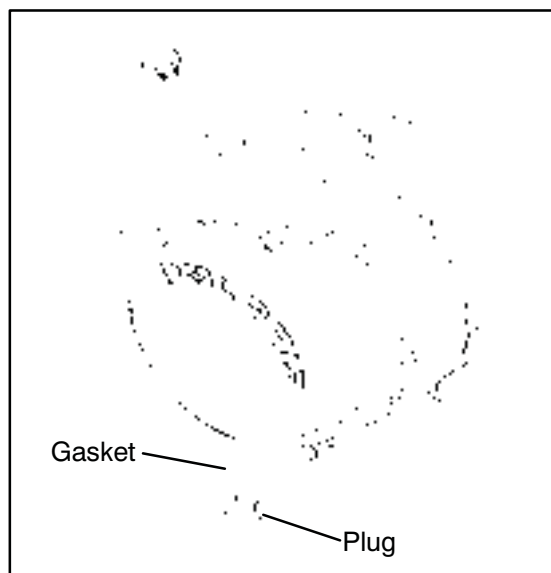
AIR INTAKE INSPECTION



1. Lift the hood.
2. Inspect the foam inserts in the air baffle boxes. If the foam inserts are dirty, clean the foam with a high flash point solvent, followed by hot soapy water.
3. Rinse and dry the foam thoroughly.
4. Inspect the foam for tears or damage. Replace if necessary.
5. Reinstall the foam inserts into the air baffle boxes.

FLYWHEEL HOUSING

- Drain the housing periodically to remove moisture.
 - Drain the flywheel housing after operating the vehicle in very wet conditions. This should also be done before storing the vehicle. The drain screw is located at the bottom of the flywheel housing. Remove the plug. Reinstall the plug once housing has been drained.
 - After travelling in wet areas the engine housing and starter should always be drained completely by removing the housing.
 - Do not open the crankcase drain unless the engine has ingested water. Some engine oil will be lost if crankcase drain is opened.

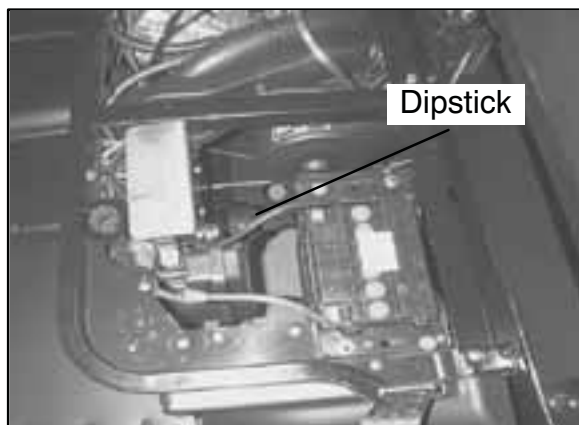




ENGINE OIL LEVEL

The oil tank is located on the left side of the vehicle. To check the oil level:

1. Set machine on a level surface.
2. Start and run engine for 20-30 seconds. This will return oil to its true level in the oil tank. About a cup of oil will remain in the crankcase.
3. Stop engine, remove the bench seat.
4. The oil tank is located on the driver side. Remove dipstick and wipe dry with a clean cloth.



5. Reinstall dipstick, screwing into place.

NOTE: The dipstick must be screwed completely in to ensure accurate measurement.



Maintain Oil Level In Normal Range

Screw in completely to check

6. Remove dipstick and check to see that the oil level is in the normal range. Add oil as indicated by the level on the dipstick. Do not overfill.

NOTE: Rising oil level between checks in cool weather driving, can indicate moisture collecting in the oil reservoir. If the oil level is over the full mark, change the oil.

OIL AND FILTER CHANGE

▲ WARNING

Personal injury can occur when handling used oil. Hot oil can cause burns or skin damage.

NOTICE:

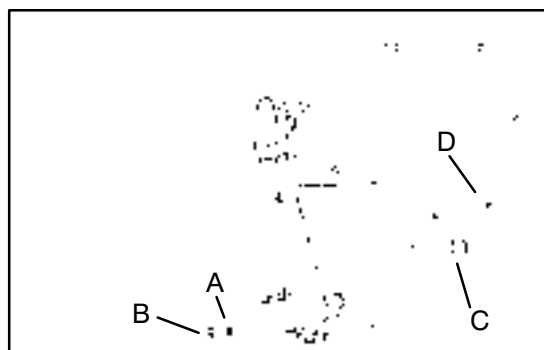
Care must be taken to ensure that fluids are contained. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembly any component containing fluids.

RECOMMENDED ENGINE OIL:

Polaris Premium Synthetic OW-40 (PN 2871281) (Quart)

Ambient Temperature Range:
-40° F to 120° F

1. Place vehicle on a level surface.
2. Run engine two to three minutes until warm. Stop engine.
3. Clean area around drain plug (B) at bottom of oil tank.
4. Place a drain pan beneath oil tank and remove drain plug. **CAUTION:** Oil may be hot. Do not allow hot oil to come into contact with skin as serious burns may result.
5. Allow oil to drain completely.
6. Replace sealing washer (A) on drain plug. **NOTE:** The sealing surfaces on drain plug and oil tank should be clean and free of burrs, nicks or scratches.

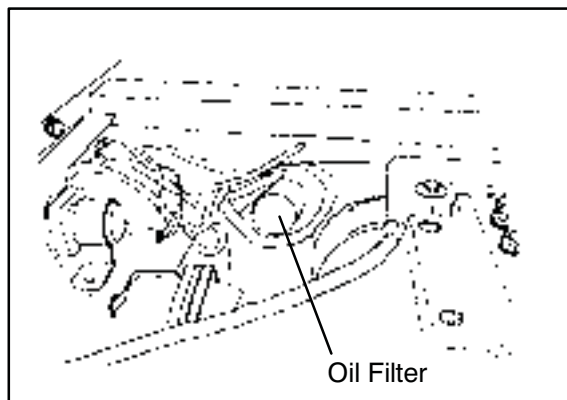


7. Reinstall drain plug and torque to 14 ft. lbs. (19 Nm).
8. Loosen clamp (D).
9. Remove oil hose from screen fitting (C) on bottom of oil tank.





10. Remove screen fitting (C).
11. Clean screen thoroughly.
12. Apply Loctite™ 565 Thread Sealant (PN 2871956) to the clean and oil free threads of the fitting.
13. Install the fitting (C) and tighten.
14. Install oil hose on fitting and install clamp.
15. Place shop towels beneath oil filter. Using an Oil Filter Wrench (PV-43527), turn filter counterclockwise to remove.



16. Using a clean dry cloth, clean filter sealing surface on crankcase.
17. Check to make sure the O-ring is in good condition. Lubricate O-ring on new filter with a film of engine oil.
18. Install new filter and turn by hand until filter gasket contacts the sealing surface, then turn and additional 1/2 turn.
19. Approximately 1 cup of engine oil will remain in the crankcase. To drain, remove drain plug found on lower right side of crankcase.

NOTE: The sealing surfaces on the drain plug and crankcase should be clean and free of burrs, nicks or scratches.

20. Reinstall drain plug.
21. Remove dipstick and fill tank with 2 quarts (1.9 l) of Polaris Premium 4 Synthetic Oil (PN 2871281).
22. Place gear selector in neutral and set parking brake.
23. **Prime oil pump using procedure below.** Stop the engine and inspect for leaks.
24. Re-check the oil level on the dipstick and add oil as necessary to bring the level to the upper mark on the dipstick.

25. Dispose of used filter and oil properly.

Oil Tank Drain Plug Torque:
14 ft. lbs. (19 Nm)

Crankcase Drain Plug Torque:
14 ft. lbs. (19 Nm)

Oil Filter Torque:
Turn by hand until filter gasket contacts sealing surface, then turn an additional 1/2 turn

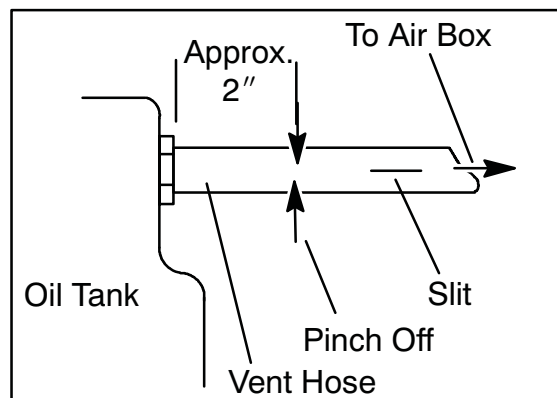
Oil Filter Wrench:
PV-43527

Oil Tank Screen Fitting Torque:
14-17 ft. lbs. (19 Nm)

OIL PUMP PRIMING PROCEDURE

NOTE: This priming procedure must be performed whenever the oil hose connection between the oil tank and pump inlet has been disconnected.

1. Clamp or pinch off vent line approximately 2" from oil tank to avoid the end of oil tank vent fitting, and before the vent line's pressure relief slit
2. Run engine for 45-60 seconds.
3. Remove the vent line clamp. The oil pump will now be properly primed and ready for field operation.





VALVE CLEARANCE

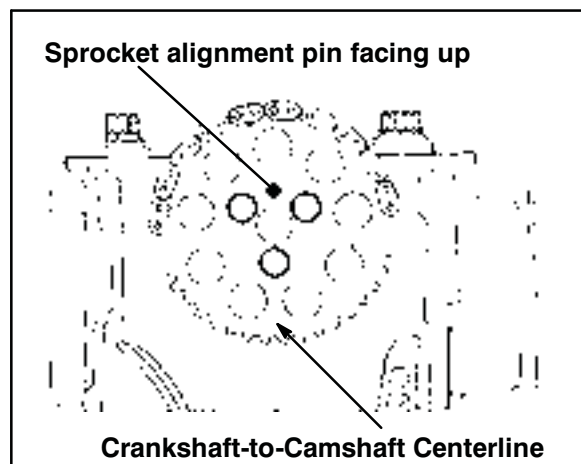
Inspect and adjust valve clearance while the engine is cold and the piston positioned at Top Dead Center (TDC) on compression stroke.

1. Remove the seat.
2. Remove body panels and fuel tank as necessary to gain access to valve cover.
3. Remove the spark plug high tension lead and remove the spark plug. **CAUTION:** Place a clean shop towel into the spark plug cavity to prevent dirt from entering.
4. Remove rocker cover bolts, cover and gasket.

NOTE: It may be necessary to tap cover lightly with a soft-faced hammer to loosen it from the cylinder head.

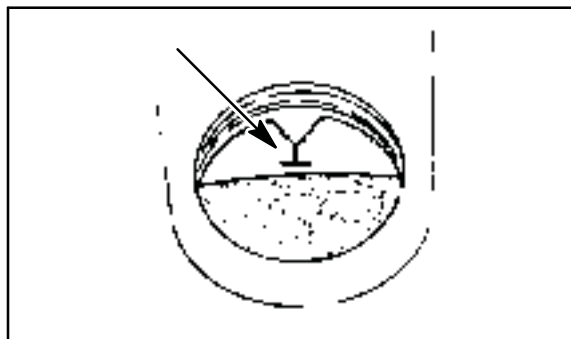
5. Remove timing inspection plug from recoil housing.

CAUTION: Failure to position the crankshaft at TDC on compression stroke will result in improper valve adjustment.



6. Rotate engine slowly with recoil rope, watching the intake valve(s) open and close.

NOTE: At this point watch the camshaft sprocket locating pin and slowly rotate engine until locating pin is facing upward, directly in line with the crankshaft to camshaft center line as shown. The camshaft lobes should be pointing downward.



7. Verify accurate TDC positioning by observing the "T" mark aligned with the pointer in the timing inspection hole. In this position there should be clearance on all valves.

INTAKE VALVE CLEARANCE ADJUSTMENT

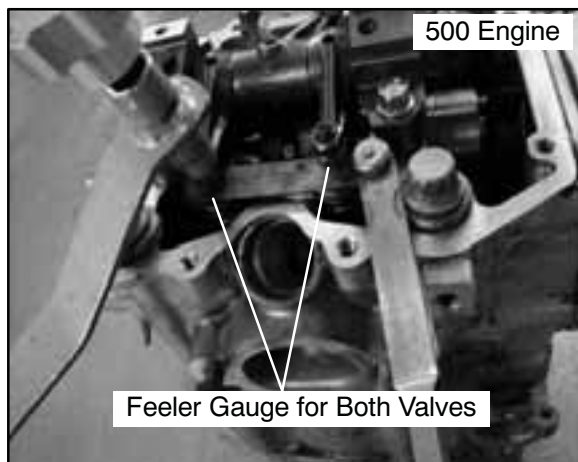
1. Insert a .006" (.15mm) feeler gauge between end of intake valve stem and clearance adjuster screw.
2. Using a 10 mm wrench and a screwdriver, loosen adjuster lock nut and turn adjusting screw until there is a slight drag on the feeler gauge.
3. Hold adjuster screw and tighten adjuster lock nut securely.
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.
6. Repeat this step for the other intake valve.

INTAKE VALVE CLEARANCE

.006" (.15 mm)



EXHAUST VALVE CLEARANCE ADJUSTMENT



NOTE: The exhaust valves share a common rocker arm, and must be adjusted using two feeler gauges.

1. Insert .006 feeler gauge(s) between end of exhaust valve stem and adjuster screw(s).
2. Loosen locknut(s) and turn adjuster screw(s) until there is a slight drag on feeler gauge(s). The Valve/Clutch Adjuster Tool (**PA-44689**) can be used to adjust the 425/500 engines valves.
NOTE: Both feeler gauges should remain inserted during adjustment of each valve.

EXHAUST VALVE CLEARANCE

.006" (.15 mm)

3. When clearance is correct, hold adjuster screw and tighten locknut securely
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

STEERING

The steering components should be checked periodically for loose fasteners, worn tie rod ends, and damage. Also check to make sure all cotter pins are in place. If cotter pins are removed, they must not be re-used. Always use new cotter pins.

Replace any worn or damaged steering components. Steering should move freely through entire range of travel without binding. Check routing of all cables, hoses, and wiring to be sure the steering mechanism is not restricted or limited. **NOTE:** Whenever steering

components are replaced, check front end alignment. Use only genuine Polaris parts.

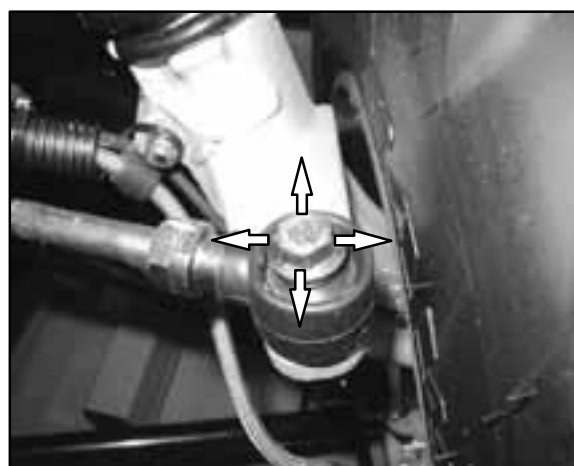
⚠ WARNING

Due to the critical nature of the procedures outlined in this chapter, Polaris recommends steering component repair and adjustment be performed by an authorized Polaris MSD-certified technician when replacing worn or damaged steering parts. Use only genuine Polaris replacement parts.

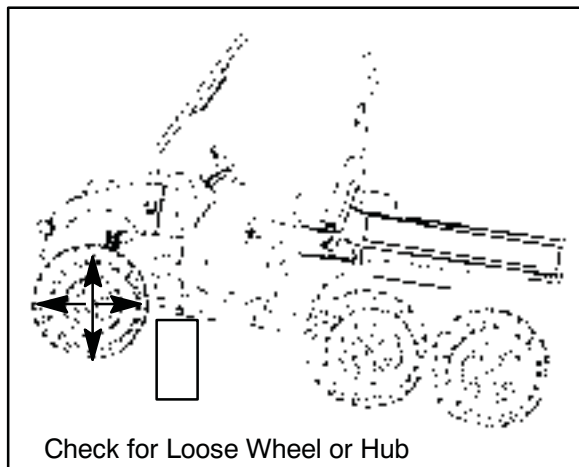
One of two methods can be used to measure toe alignment. The string method and the chalk method. If adjustment is required, refer to following pages for procedure.

TIE ROD END / STEERING INSPECTION

- To check for play in the tie rod end, grasp the steering tie rod, pull in all directions feeling for movement.
- Repeat inspection for inner tie rod end (on steering post).
- Replace any worn steering components. Steering should move freely through entire range of travel without binding.



- Elevate front end of machine so front wheels are off the ground. Check for any looseness in front hub / wheel assembly by grasping the tire firmly at top and bottom first, and then at front and rear. Try to move the wheel and hub by pushing inward and pulling outward.



Check for Loose Wheel or Hub

- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause (loose wheel nuts or loose front hub nut).
- Refer to the Body/Steering or Final Drive chapter for more information.

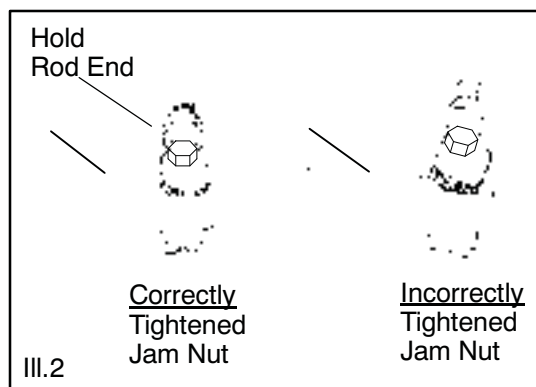
CAMBER AND CASTER

The camber and caster are non-adjustable.

TOE ALIGNMENT ADJUSTMENT

If toe alignment is incorrect, measure the distance between vehicle center and each wheel. This will tell you which tie rod needs adjusting. **NOTE:** Be sure handlebars are straight ahead before determining which tie rod(s) need adjustment.

CAUTION: During tie rod adjustment, it is very important that the following precautions be taken when tightening tie rod end jam nuts. If the rod end is positioned incorrectly it will not pivot, and may break.



To adjust toe alignment:

- Hold tie rod end to keep it from rotating.
- Loosen jam nuts at both end of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in Method 1 or Method 2.
- **IMPORTANT:** When tightening the tie rod end jam nuts, the rod ends must be held parallel to prevent rod end damage and premature wear. Damage may not be immediately apparent if done incorrectly. See illustration 2.
- After alignment is complete, torque jam nuts to 12-14 ft. lbs. (16-19 Nm).



EXHAUST PIPE

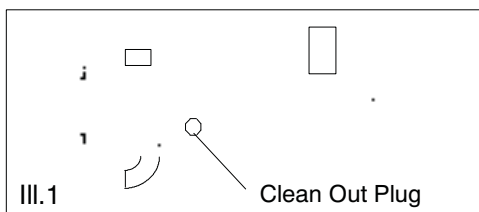
WARNING

- Do not perform clean out immediately after the engine has been run, as the exhaust system becomes very hot. Serious burns could result from contact with exhaust components.
- To reduce fire hazard, make sure that there are no combustible materials in the area when purging the spark arrestor.
- Wear eye protection.
- Do not stand behind or in front of the vehicle while purging the carbon from the spark arrestor.
- Never run the engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas.
- Do not go under the machine while it is inclined. Set the hand brake and block the wheels to prevent roll back.

Failure to heed these warnings could result in serious personal injury or death.

The exhaust pipe must be periodically purged of accumulated carbon as follows:

1. Remove the clean out plugs located on the bottom of the muffler as shown in illustration 1.



2. Place the transmission in neutral and start the engine. Purge accumulated carbon from the system by momentarily revving the engine several times.
3. If some carbon is expelled, cover the exhaust outlet and rap on the pipe around the clean out plugs while revving the engine several more times.
4. If particles are still suspected to be in the muffler, back the machine onto an incline so the rear of the machine is one foot higher than the front. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3.

SEE WARNING

5. If particles are still suspected to be in the muffler, drive the machine onto the incline so the front of the machine is one foot higher than the rear. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**
6. Repeat steps 2 through 5 until no more particles are expelled when the engine is revved.
7. Stop the engine and allow the arrestor to cool.
8. Reinstall the clean out plugs.

BRAKE SYSTEM INSPECTION

The following checks are recommended to keep the brake system in good operating condition. Service life of brake system components depends on operating conditions. Inspect brakes in accordance with the maintenance schedule and before each ride.

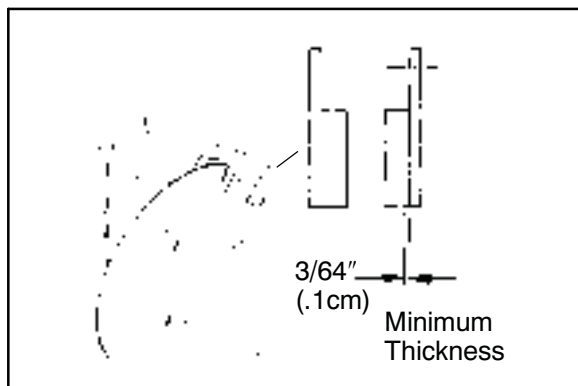


- Keep fluid level in the master cylinder reservoir to the indicated level inside reservoir.
- Use Polaris DOT 3 Brake Fluid (**PN 2870990**) or DOT 4 Brake Fluid.
- Check brake system for fluid leaks.
- Check brake for excessive travel or spongy feel.
- Check friction pads for wear, damage or looseness.
- Check surface condition of the disc.



BRAKE PAD INSPECTION

Pads should be changed when the friction material is worn to 3/64" (.1 cm), or about the thickness of a dime.



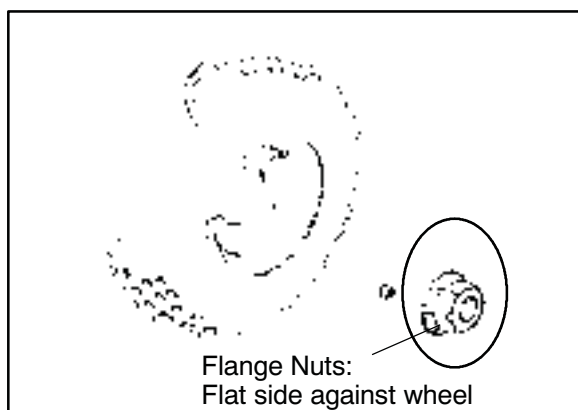
Hose/Fitting Inspection

Check brake system hoses and fittings for cracks, deterioration, abrasion, and leaks. Tighten any loose fittings and replace any worn or damaged parts.

WHEEL, HUB, AND SPINDLE TORQUE TABLE

Item	Specification
Front Wheel Nuts	35 Ft. Lbs. (47 Nm)
Rear Wheel Nuts	35 Ft. Lbs. (47 Nm)
Front Spindle Nut	40 Ft. Lbs. (55 Nm)
Rear & Center Hub Retain- ing Nut	110 Ft. Lbs. (150 Nm)

WHEEL REMOVAL FRONT OR REAR



1. Stop the engine, place the transmission in gear and lock the parking brake.
2. Loosen the wheel nuts slightly.
3. Elevate the side of the vehicle by placing a suitable stand under the footrest frame.
4. Remove the wheel nuts and remove the wheel.

WHEEL INSTALLATION

1. With the transmission in gear and the parking brake locked, place the wheel in the correct position on the wheel hub. Be sure the valve stem is toward the outside and rotation arrows on the tire point toward forward rotation.
2. Attach the wheel nuts and finger tighten them.
3. Lower the vehicle to the ground.
4. Securely tighten the wheel nuts to the proper torque listed in the table above.

CAUTION:

If wheels are improperly installed it could affect vehicle handling and tire wear. On vehicles with tapered rear wheel nuts, make sure tapered end of nut goes into taper on wheel.



TIRE PRESSURE

CAUTION:

Maintain proper tire pressure. Refer to the warning tire pressure decal applied to the vehicle.

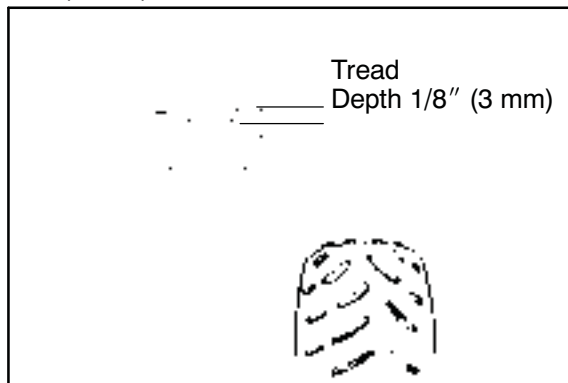
Tire Pressure Inspection (PSI - Cold)	
Front	Center & Rear
10	10

TIRE INSPECTION

- Improper tire inflation may affect vehicle maneuverability.
- When replacing a tire always use original equipment size and type.
- The use of non-standard size or type tires may affect vehicle handling.

Tire Tread Depth

Always replace tires when tread depth is worn to 1/8" (3 mm) or less.



▲ WARNING

Operating a *RANGER* with worn tires will increase the possibility of the vehicle skidding easily with possible loss of control.

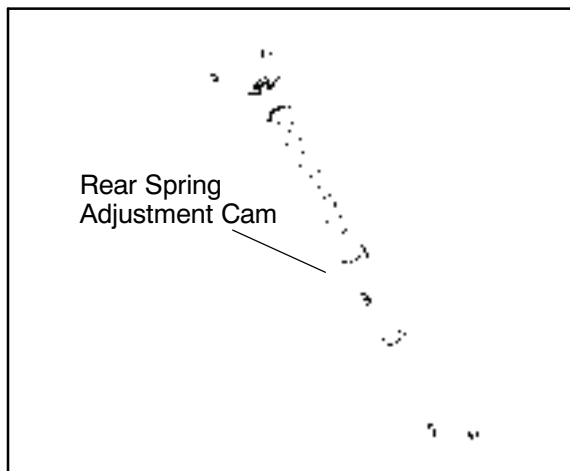
Worn tires can cause an accident.

Always replace tires when the tread depth measures 1/8" (.3 cm) or less.

that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

- Check all rear suspension components for wear or damage.

FRONT SUSPENSION



Shock Spanner Wrench

(PN 2870872)

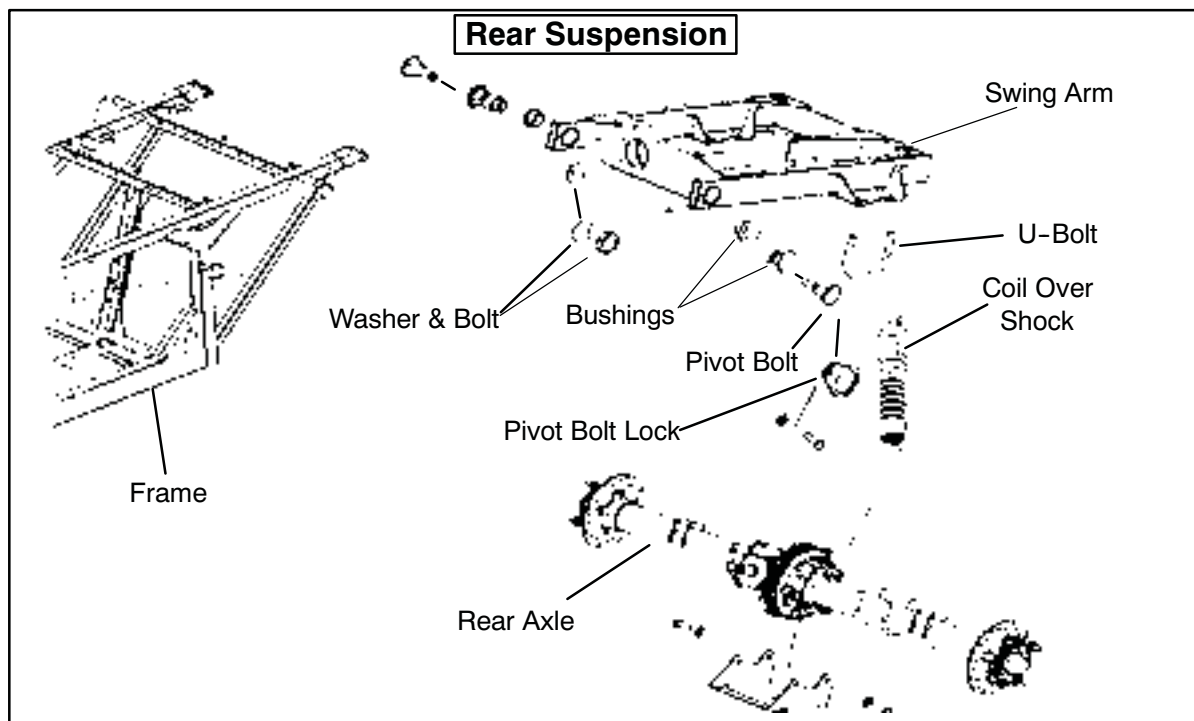
- Compress and release front suspension. Damping should be smooth throughout the range of travel.
- Check all front suspension components for wear or damage.
- Inspect front strut cartridges for leakage.

FRAME, NUTS, BOLTS, FASTENERS

Periodically inspect the torque of all fasteners in accordance with the maintenance schedule. Check



REAR SUSPENSION



- Compress and release rear suspension. Damping should be smooth throughout the range of travel.
- Check all rear suspension components for wear or damage.
- Inspect shock for leakage.

[illegible]



CHAPTER 3 **ENGINE**

Torque Specifications	3.2
Special Tools	3.2
Service Data	3.3-3.4
Torque Patterns	3.5
Piston Identification	3.5
Cooling System Pressure Test	3.6-3.7
Cooling System Specifications	3.7
Engine Removal	3.7
Engine Installation Notes	3.8
Cylinder Honing	3.8-3.9
Crankshaft Runout Inspection	3.9-3.10
Engine Lubrication	3.10
Oil Pump Priming Procedure	3.10
Lubrication/Oil Flow	3.11-3.12
Engine Exploded View	3.13
Engine Top End Disassembly	3.14-3.23
Valve Seat Service	3.23-3.26
Cylinder Head Assembly	3.26-3.31
Engine Bottom End Disassembly	3.31-3.36
Crankcase & Bearing Assembly	3.37-3.38
Crankshaft End Play Inspection	3.38-3.39
Counter Balancer End Play Inspection.	3.40
Oil Pump Shaft End Play Inspection	3.40-3.41
Engine Assembly/Inspection	3.41-3.51
Sealed Recoil Disassembly/Inspection	3.51-3.52
Sealed Recoil Assembly	3.52
Spark Plug Fouling Checklist	3.53
Troubleshooting	3.53-3.54





TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS		
Fastener	Size	EH42PLE/ EH50PLE Ft. Lbs. (Nm)
Blind Plug (Oil Pressure)	1/8 PT (28tpi)	6.5-11 (9-15 Nm)
Camshaft Sprocket	6mm	5-6.5 (7-9 Nm)
Camshaft Chain Tensioner Lever	6mm	5-6.5 (7-9 Nm)
Camshaft Chain Tensioner	6mm	5-6.5 (7-9 Nm)
Camshaft Chain Tensioner Cap	11mm	14-19 (20-25 Nm)
Carburetor Adaptor	8mm	12-14 (16-20 Nm)
Crankcase	8mm	14-15 (19-21 Nm)
Crankshaft Slotted Nut (Cam Chain Drive Sprocket)	28mm	35-51 (47-69 Nm)
Cylinder Base Bolts	10mm 6mm	45-49 (61-67 Nm) 6-8 (9-11 Nm)
Cylinder Head Bolts	11mm 6mm	Refer to Engine Assembly for torque procedure
Drive Clutch Bolt	7/16 - 20	40 (55 Nm)
Flywheel	16mm	58-72 (78-98 Nm)
Oil Delivery Pipe	12mm	11-15 (15-21 Nm)
Oil Drain Bolt (Crankcase)	14mm	14-17 (19-23 Nm)
Oil Filter Pipe Fitting	20mm	36-43 (49-59 Nm)
Oil Hose Fitting	1/8 Pipe Thread	6.5-11 (9-15 Nm)
Oil Pump	6mm	5-6.5 (7-9 Nm)
Oil Pump Case Screw	5mm	1.5-2 (2-3 Nm)
One Way Valve	11mm	14-19 (20-25 Nm)
Recoil Housing	6mm	5-6.5 (7-9 Nm)
Rocker Cover	6mm	7-8 (9-11 Nm)
Rocker Support	8mm	8-10 (11-13 Nm)
Rocker Adjuster Screw	6mm	6-7 (8-10 Nm)
Water Pump Impeller Nut	6mm	5-6.5 (7-9 Nm)

Water Pump Housing Cover	6mm	5-6.5 (7-9 Nm)
Stator Plate	6mm	5-6.5 (7-9 Nm)
Starter Motor	6mm	5-6.5 (7-9 Nm)
Spark Plug	14mm	9-11 (12-15 Nm)

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2200634	Valve Seat Reconditioning Kit
2870390	Piston Support Block
2871043	Flywheel Puller
2871283	Crankshaft/Water Pump Seal Install Kit
5131135	Water Pump Install Kit
2870569	Crankshaft Truing Stand
2870975	Mity Vac™ Pressure Test Tool
PV-43527	Oil Filter Wrench

**ENGINE SERVICE DATA**

Cylinder Head / Valve				EH42PLE		EH50PLE	
Rocker Arm	Rocker arm ID			.8669-.8678" (22.020-22.041 mm)		.8669-.8678" (22.020-22.041 mm)	
	Rocker shaft OD			.8656-.8661" (21.987-22.0 mm)		.8656-.8661" (21.987-22.0 mm)	
	Rocker shaft Oil Clearance		Std	.0008-.0021" (.020-.054 mm)		.0008-.0021" (.020-.054 mm)	
			Limit	.0039" (.10 mm)		.0039" (.10 mm)	
Camshaft	Cam lobe height	In	Std	1.2884-1.2924" (32.726-32.826 mm)		1.2884-1.2924" (32.726-32.826 mm)	
			Limit	1.2766" (32.426 mm)		1.2766" (32.426 mm)	
		Ex	Std	1.2884-1.2924" (32.726-32.826 mm)		1.2884-1.2924" (32.726-32.826 mm)	
			Limit	1.2766" (32.426 mm)		1.2766" (32.426 mm)	
	Camshaft journal OD		Mag	1.4935-1.4941" (37.935-37.950 mm)		1.4935-1.4941" (37.935-37.950 mm)	
			PTO	1.4935-1.4941" (37.935-37.950 mm)		1.4935-1.4941" (37.935-37.950 mm)	
	Camshaft journal bore ID		Mag	1.4963-1.4970" (38.005-38.025 mm)		1.4963-1.4970" (38.005-38.025 mm)	
			PTO	1.4963-1.4970" (38.005-38.025 mm)		1.4963-1.4970" (38.005-38.025 mm)	
	Camshaft Oil clearance		Std	.0022-.0035" (.055-.090 mm)		.0022-.0035" (.055-.090 mm)	
			Limit	.0039" (.10 mm)		.0039" (.10 mm)	
Cylinder Head	Surface warpage limit			.0020" (.05 mm)		.0020" (.05 mm)	
	Standard height			3.870" (98.3 mm)		3.870" (98.3 mm)	
Valve Seat	Contacting width	In	Std	.028" (.7 mm)		.028" (.7 mm)	
			Limit	.055" (1.4 mm)		.055" (1.4 mm)	
		Ex	Std	.039" (1.0 mm)		.039" (1.0 mm)	
			Limit	.071" (1.8 mm)		.071" (1.8 mm)	
Valve Guide	Inner diameter			.2362-.2367" (6.0-6.012 mm)		.2362-.2367" (6.0-6.012 mm)	
	Protrusion above head			.689-.709" (17.5-18.0 mm)		.689-.709" (17.5-18.0 mm)	
Valve	Margin thickness	In	Std	.039" (1.0 mm)		.039" (1.0 mm)	
			Limit	.031" (.8 mm)		.031" (.8 mm)	
		Ex	Std	.047" (1.2 mm)		.047" (1.2 mm)	
			Limit	.031" (.8 mm)		.031" (.8 mm)	
Valve	Stem diameter		In	.2343-.2348" (5.950-5.965 mm)		.2343-.2348" (5.950-5.965 mm)	
			Ex	.2341-.2346" (5.945-5.960 mm)		.2341-.2346" (5.945-5.960 mm)	
	Stem oil clearance	Std	In	.0014-.0024" (.035-.062 mm)		.0014-.0024" (.035-.062 mm)	
			Ex	.0016-.0026" (.040-.067 mm)		.0016-.0026" (.040-.067 mm)	
		Limit		.0059" (.15 mm)		.0059" (.15 mm)	
	Overall length		In	3.976" (101.0 mm)		3.976" (101.0 mm)	
Ex			3.984" (101.2 mm)		3.984" (101.2 mm)		
Valve Spring	Overall length		Std	1.654" (42.0 mm)		1.654" (42.0 mm)	
			Limit	1.575" (40.0 mm)		1.575" (40.0 mm)	
	Squareness			.075" (1.9 mm)		.075" (1.9 mm)	



ENGINE SERVICE DATA

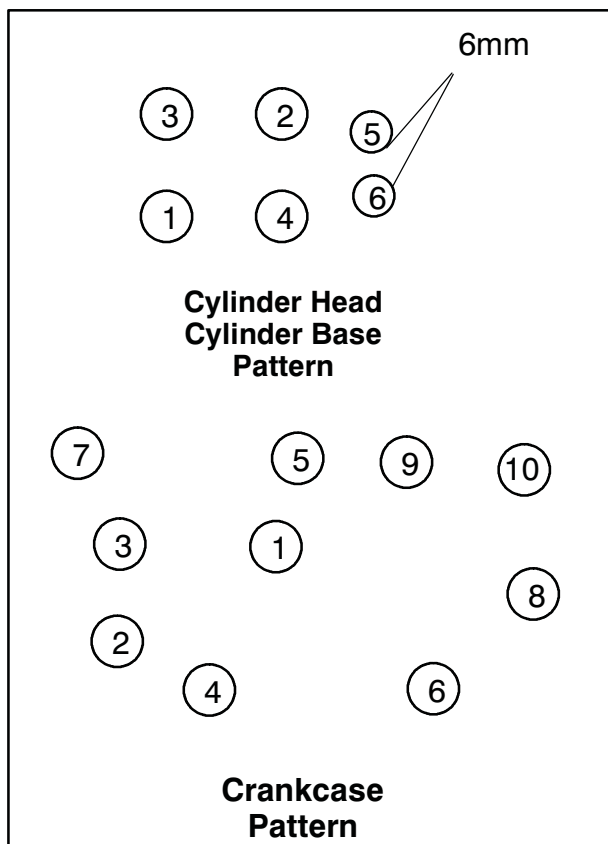
Cylinder / Piston / Connecting Rod				EH42PLE	EH50PLE
Cylinder	Surface warpage limit (mating with cylinder head)			.0020" (.05 mm)	.0020" (.05 mm)
	Cylinder bore		Std	3.4606-3.614" (87.900-87.920 mm)	3.6221-3.6228" (92.00-92.02 mm)
	Taper limit			.0020" (.050 mm)	.0020" (.050 mm)
	Out of round limit			.0020" (.050 mm)	.0020" (.050 mm)
	Piston clearance		Std	.0006-.0018" (.015-.045 mm)	.0006-.0018" (.015-.045 mm)
			Limit	.0024" (.060 mm)	.0024" (.060 mm)
	Boring limit			.020" (.5 mm)	.020" (.5 mm)
Piston	Outer diameter	Std	3.4596-3.4600" (87.875-87.885 mm)	3.6204-3.6215" (91.970-91.985 mm)	
		.0098" (.25 mm) OS	3.4695-3.4699" (88.125-88.135 mm)	3.6304-3.6310" (92.21-92.23 mm)	
		.0197" (.50 mm) OS	3.4793-3.4797" (88.375-88.385 mm)	3.6403-3.6407" (92.46-92.47 mm)	
	Standard inner diameter of piston pin bore			.9055-.9057" (23.0-23.006 mm)	.9055-.9057" (23.0-23.006 mm)
Piston Pin	Outer diameter			.9053-.9055" (22.994-23.0 mm)	.9053-.9055" (22.994-23.0 mm)
	Standard clearance-piston pin to pin bore			.0002-.0003" (.004-.008 mm)	.0002-.0003" (.004-.008 mm)
	Degree of fit			Piston pin must be a push (by hand) fit at 68° F (20° C)	
Piston Ring	Piston ring installed gap	Top ring	Std	.0079-.0138" (.20-.36 mm)	.0079-.0138" (.20-.36 mm)
			Limit	.039" (1.0 mm)	.039" (1.0 mm)
		Second ring	Std	.0079-.0138" (.20-.36 mm)	.0079-.0138" (.20-.36 mm)
			Limit	.039" (1.0 mm)	.039" (1.0 mm)
		Oil ring	Std	.0079-.0276" (.20-.70 mm)	.0079-.0276" (.20-.70 mm)
			Limit	.059" (1.5 mm)	.059" (1.5 mm)
Piston Ring	Standard clearance - piston ring to ring groove	Top ring	Std	.0016-.0031" (.040-.080 mm)	.0016-.0031" (.040-.080 mm)
			Limit	.0059" (.15 mm)	.0059" (.15 mm)
		Second ring	Std	.0012-.0028" (.030-.070 mm)	.0012-.0028" (.030-.070 mm)
			Limit	.0059" (.15 mm)	.0059" (.15 mm)
Connecting Rod	Connecting rod small end ID			.9058-.9063" (23.007-23.020 mm)	.9058-.9063" (23.007-23.020 mm)
	Connecting rod small end radial clearance		Std	.0003-.0010" (.007-.026 mm)	.0003-.0010" (.007-.026 mm)
			Limit	.0020" (.05 mm)	.0020" (.05 mm)
	Connecting rod big end side clearance		Std	.0039-.0256" (.1-.65 mm)	.0039-.0256" (.1-.65 mm)
			Limit	.0315" (.80 mm)	.0315" (.80 mm)
	Connecting rod big end radial clearance		Std	.0004-.0015" (.011-.038 mm)	.0004-.0015" (.011-.038 mm)
Limit			.0020" (.05 mm)	.0020" (.05 mm)	
Crankshaft	Crankshaft runout limit			.0024" (.06 mm)	.0024" (.06 mm)

KEY - Std: Standard; OS: Oversize; ID: Inner Diameter;
 OD: Outer Diameter; Mag: Magneto Side; PTO: Power
 Take Off Side



ENGINE FASTENER TORQUE PATTERNS

Tighten cylinder head, cylinder base, and crankcase fasteners in 3 steps following the sequence outlined below.



Engine Model No.	Oversize Available* (mm)	Piston Length	Standard Piston Identification
EH50PLE	.25 .50	72 mm	C
EH42PLE	25 .50	66 mm	B

*Pistons and rings marked 25 equal .25mm (.010") oversized

Pistons and rings marked 50 equal .50mm (.020") oversized

PISTON IDENTIFICATION

The piston may have an identification mark or the piston may not have an identification mark for piston placement. If the piston has an identification mark, follow the directions for piston placement below. If the piston does not have an identification mark, the direction for placement of the piston does not matter.

Note the directional and identification marks when viewing the pistons from the top. The letter "F", "→", "►" or "■" must always be toward the flywheel side of the engine. The other numbers are used for identification as to diameter, length and design. Four stroke engine rings are rectangular profile. See text for oil control ring upper rail installation. Use the information below to identify pistons and rings.



COOLING SYSTEM

WARNING: Never remove radiator cap when engine is warm or hot. The cooling system is under pressure

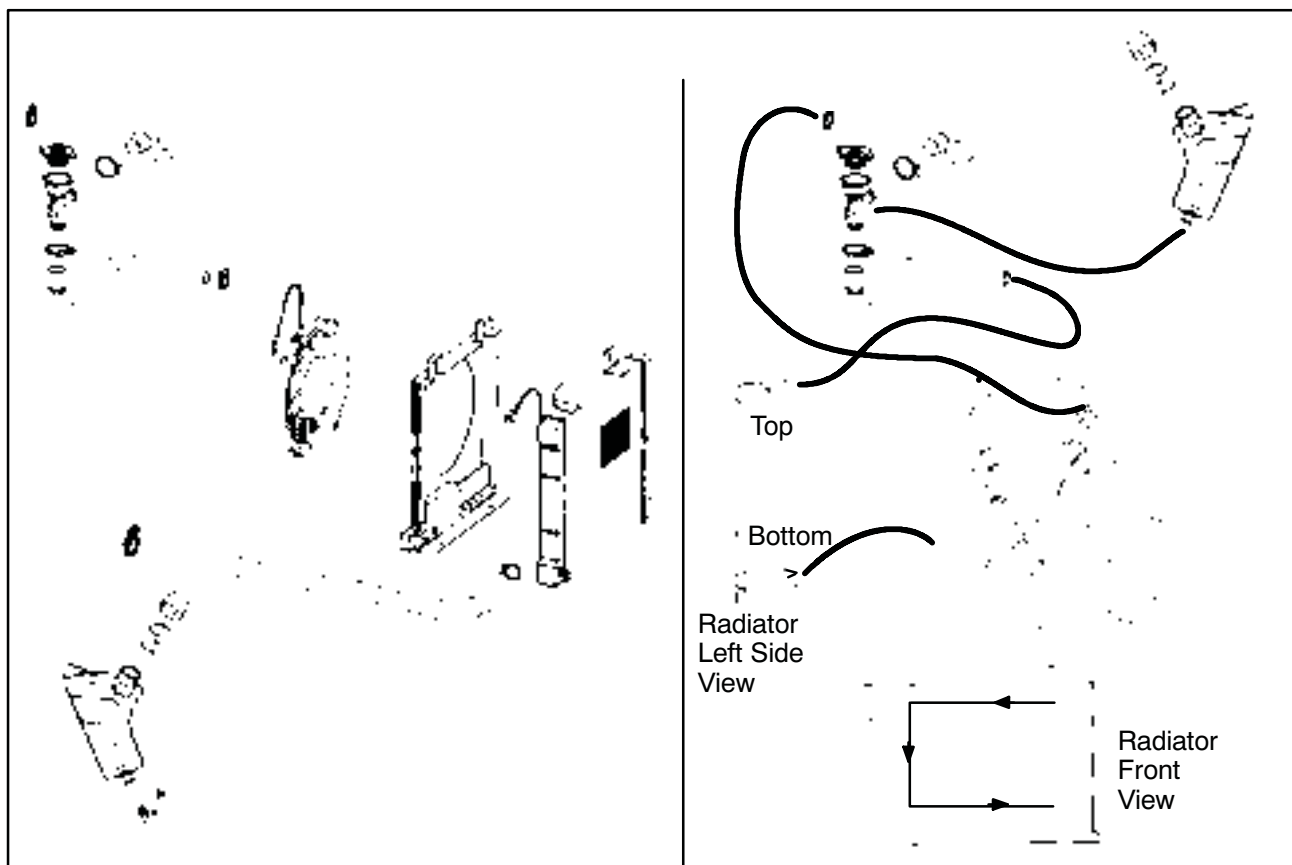
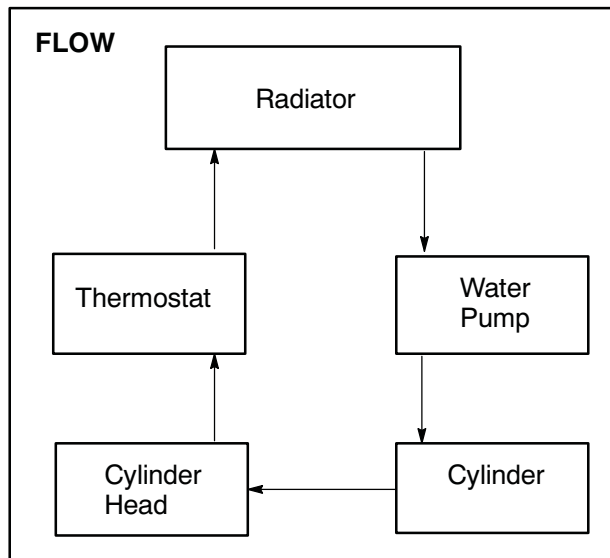
and serious burns may result. Allow the engine and cooling system to cool before servicing.

System Pressure Test

1. Remove front cover.
2. Remove recovery bottle hose from coolant filler.
3. Connect a Mity Vac™ (PN 2870975) to radiator and pressurize system to 10 PSI. The system must retain 10 lbs of pressure for five minutes or longer. If pressure loss is evident within five minutes, check radiator, all cooling system hoses and clamps, or water pump seal.

Radiator Cap Pressure Test

1. Remove radiator cap and test using a cap tester (commercially available).
2. The radiator cap relief pressure is 13 lbs.





RECOMMENDED COOLANT

Use only high quality antifreeze/coolant mixed with *distilled* water in a 50/50 or 60/40 ratio, depending on freeze protection required in your area. **CAUTION:** Using tap water in the cooling system will lead to a buildup of deposits which may restrict coolant flow and reduce heat dissipation, resulting in possible engine damage. Polaris Premium 60/40 Antifreeze/Coolant is recommended for use in all cooling systems, and comes pre-mixed and ready to use.

COOLING SYSTEM SPECIFICATIONS

Fan Switch (Off)	149° F (65° C) ± 8°
Fan Switch (On)	180° F (82° C) ± 3°
Hot Light On	221° F (105° C)
System Capacity	2.25 Quarts
Radiator Cap Relief Pressure	13 PSI
Thermostat	Starts opening 176° F (80° C) Open 8mm @ 205° F (96° C)

ACCESSIBLE COMPONENTS

The following components can be serviced or removed with the engine installed in the frame:

- Flywheel
- Alternator/Stator
- Starter Motor/Starter Drive
- Cylinder Head
- Cylinder
- Piston/Rings
- Camshaft
- Rocker Arms
- Cam Chain and Sprockets
- Water Pump / Water Pump Mechanical Seal*

The following components require engine removal for service:

- Oil pump / Oil Pump Drive Gear
- Counterbalance Shaft or Bearing(s)
- Connecting Rod
- Crankshaft

- Crankshaft Main Bearings
- Crankcase

*It may be necessary to loosen engine mounts and move engine slightly to access water pump. Use the Water Pump Mechanical Seal Puller (**PN 2872105**) to replace mechanical seal with engine in frame.

ENGINE REMOVAL (TYPICAL)

1. Clean work area.
2. Thoroughly clean the ATV engine and chassis.
3. Disconnect battery negative (-) cable.
4. Remove the following parts as required.
 - Seat
 - Left and Right Side Covers (Refer to Chapter 5)
 - Fuel Tank Cover / Front Cab (Refer to Chapter 5)
 - Fuel Tank (Refer to Chapter 4)
5. Disconnect spark plug high tension lead.
6. Remove springs from exhaust pipe and remove pipe.
7. Drain coolant and engine oil.
8. Remove air pre-cleaner and duct.
9. Remove airbox.
10. Remove carburetor. Insert a shop towel into the carburetor flange to prevent dirt from entering the intake port.
11. Remove center chain guard on chain drive AWD models.
12. Remove center drive and driven sprocket bolts and remove chain and sprockets as an assembly.
13. Refer to PVT System to remove outer clutch cover, drive belt, drive clutch, driven clutch, and inner cover.
14. Starter motor. Note ground cable location. Mark positive (+) cable mounting angle and remove cable.
15. Remove transmission linkage rod(s) from gear selector and secure out of the way.
16. Disconnect coolant temperature sensor wire.
17. Remove engine to chassis ground cable.
18. Remove all engine mount nuts and / or engine mount plates.
19. Remove engine through right side of frame.



ENGINE INSTALLATION

NOTES

After the engine is installed in the frame, review this checklist and perform all steps that apply.

General Items

1. Install previously removed components using new gaskets, seals, and fasteners where applicable.
2. Perform regular checks on fluid levels, controls, and all important areas on the vehicle as outlined in the daily pre-ride inspection checklist (refer to Chapter 2 or the Owner's Safety and Maintenance Manual).

PVT System

1. Adjust center distance of drive and driven clutch. (Chapter 6)
2. Adjust clutch offset, alignment, and belt deflection. (Chapter 6)
3. Clean clutch sheaves thoroughly and inspect inlet and outlet ducts for proper routing and sealing. (Chapter 6)

Transmission

1. Inspect transmission operation and adjust linkage if necessary. Refer to Chapter 2 and Chapter 8.

Exhaust

1. Replace exhaust gaskets. Seal connections with high temp silicone sealant.
2. Check to be sure all springs are in good condition.

Bleed Cooling System

1. Remove radiator cap and slowly add coolant to top of filler neck.
2. Fill coolant reservoir tank to full mark.
3. Install radiator cap and squeeze coolant lines to force air out of system.
4. Again remove radiator cap and slowly add coolant to top of fill neck.
5. Start engine and observe coolant level in the radiator. Allow air to purge and top off as necessary. Reinstall radiator cap and bring engine to operating temp. Check level in reservoir tank after engine is cool and add coolant if necessary.

Engine Break In Period

4 Cycle Engine Break-In Period is defined as the first 10 hours of engine operation, or 2 full tanks of fuel.

1. Use only Polaris Premium 4 All Season synthetic oil. Never substitute or mix oil brands. Serious engine damage can result.

2. Use fuel with a minimum octane of 87 (R+M)/2 method.
3. Change break-in oil and filter at 20 hours or 500 miles, whichever comes first.

CYLINDER HONE SELECTION/HONING PROCEDURE

CAUTION:

Selecting a hone which will straighten as well as remove material from the cylinder is very important. Using a common spring loaded finger type glaze breaker for honing is never advised. Polaris recommends using a rigid hone or arbor honing machine which also has the capability of oversizing.

Cylinders may be wet or dry honed depending upon the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

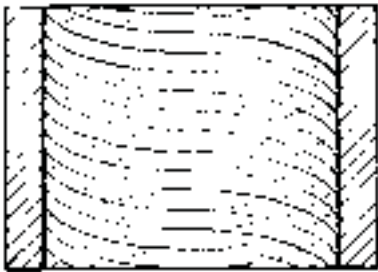
NOTE: See next page for more information on honing.



HONING TO OVERSIZE

CAUTION: If cylinder wear or damage is excessive, it will be necessary to oversize the cylinder using a new oversize piston and rings. This may be accomplished by either boring the cylinder and then finish honing to the final bore size, or by rough honing followed by finish honing.

CAUTION: For oversize honing always wet hone using honing oil and a coarse roughing stone. Measure the piston (see piston measurement) and rough hone to the size of the piston. Always leave .002 - .003" (.05 - .07 mm) for finish honing. Refer to piston-to-cylinder clearance specifications on Page 3.4 before honing. Complete the sizing with fine grit stones to provide the proper cross-hatch finish and required piston clearance.



EXAMPLE OF CROSS HATCH PATTERN

A finished cylinder should have a cross-hatch pattern to ensure piston ring seating and to aid in the retention of the fuel/oil mixture during initial break in. Hone cylinder according to hone manufacturer's instructions, or these guidelines:

- Use a motor speed of approximately 300-500 RPM, run the hone in and out of the cylinder rapidly until cutting tension decreases. Remember to keep the hone drive shaft centered (or cylinder centered on arbor) and to bring the stone approximately 1/2" (1.3 cm) beyond the bore at the end of each stroke.
- Release the hone at regular intervals and inspect the bore to determine if it has been cleared, and to check piston fit.
NOTE: Do not allow cylinder to heat up during honing. The thinner areas of the liner around the ports will expand causing uneven bore.
- After honing has been completed inspect all port opening areas for rough or sharp edges. Apply a slight chamfer to all ports

to remove sharp edges or burrs, paying particular attention to the corners of the intake and exhaust ports.

CLEANING THE CYLINDER AFTER HONING

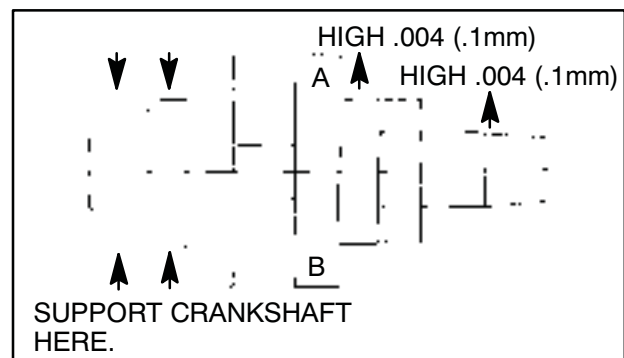
It is very important that the cylinder be thoroughly cleaned after honing to remove all grit material. Wash the cylinder in a solvent, then in hot, soapy water. Pay close attention to areas where the cylinder sleeve meets the aluminum casting (transfer port area). Use electrical contact cleaner if necessary to clean these areas. Rinse thoroughly, dry with compressed air, and oil the bore immediately with Polaris 2 Cycle Lubricant.

CRANKSHAFT STRAIGHTENING

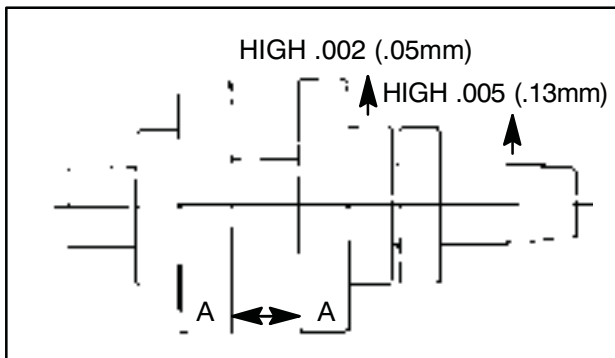
Lubricate the bearings and clamp the crankshaft securely in the Crankshaft Truing Stand (PN 2870569). Refer to the illustrations below.

Crankshaft Truing Stand (PN 2870569)

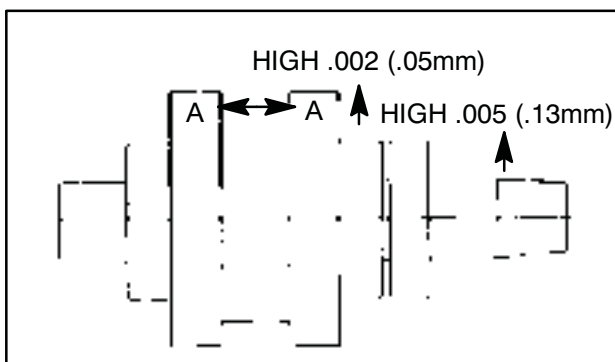
NOTE: The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



1. To correct a situation like the one shown in the illustration at right, strike the shaft at point A with a brass hammer.



2. To correct a situation like the one shown in the illustration at right, squeeze the crankshaft at point A. (Use tool from alignment kit).



3. If the crank rod pin location is 180° from the dial indicator (opposite that shown above), it will be necessary to spread the crankshaft at position A as shown in the illustration at right. When rebuilding and straightening a crankshaft, runout must be as close to zero as possible.

NOTE: Maximum allowable runout is .0024".

ENGINE LUBRICATION - EH42PL/EH50PL

Oil Type Polaris Premium 4 Synthetic
(PN 2871281)

Capacity Approximately 2 U.S.
Quarts (1.9 l)

Filter **PN 3084963**

Filter Wrench **(PV-43527)**

*Drain Plug / Screen Fitting ... 14 ft. lbs. (19 Nm) (If
fitting is removed, follow oil pump priming procedure).

*Oil Pressure Specification ... 20 PSI @ 5500
RPM, Polaris OW-40 Synthetic (Engine Hot)

OIL PRESSURE TEST - EH42PL/EH50PL

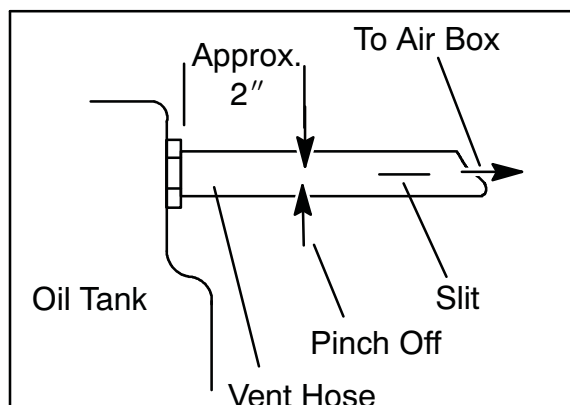
1. Remove blind plug on front left cylinder head.
2. Insert a 1/8 NPT oil pressure gauge adaptor into the cylinder head and attach the gauge.
3. Start engine and allow it to reach operating temperature, monitoring gauge indicator.

NOTE: Use Polaris Premium 4 Synthetic Engine Lubricant (PN 2871281).

Oil Pressure at 5500 RPM (Engine Hot):
Standard: 20 PSI
Minimum: 12 PSI

OIL PUMP PRIMING PROCEDURE

NOTE: This priming procedure must be performed whenever the oil hose connection between the oil tank and pump inlet has been disconnected.



1. Clamp or pinch off vent line approximately 2" from oil tank to avoid the end of oil tank vent fitting, and the vent line's pressure relief slit
2. Run engine for 45-60 seconds.
3. Remove the vent line clamp. **Note:** If the line is bled properly you should hear air release, if you do not hear air the line has not bled. The oil pump will now be properly primed and ready for field operation.



OIL FLOW - EH42PL/EH50PL

The chart on Page 3.12 describes the flow of oil through the EH42PL/EH50PL engine. Beginning at the oil tank, the oil flows through a screen fitting in the bottom of the tank and into the oil supply hose. The feed side of the oil pump draws oil through the hose and into the crankcase oil gallery, and then pumps the oil through another passage to the one way valve. (When the engine is off, the one way valve closes to prevent oil in the tank from draining into the crankcase.) The oil is pumped through a delivery pipe to the oil filter. If the oil filter is obstructed, a bypass valve contained in the filter allows oil to bypass the filter element.

At this point, the oil is diverted in two directions. Oil is supplied to the camshaft through the left front cylinder stud, and an oil passage in the head. Oil enters the camshaft through the PTO (L) journal. The camshaft journals, cam lobes, and rocker arms are lubricated through holes in the camshaft. The oil lubricates the cam chain and sprocket and drains to the sump.

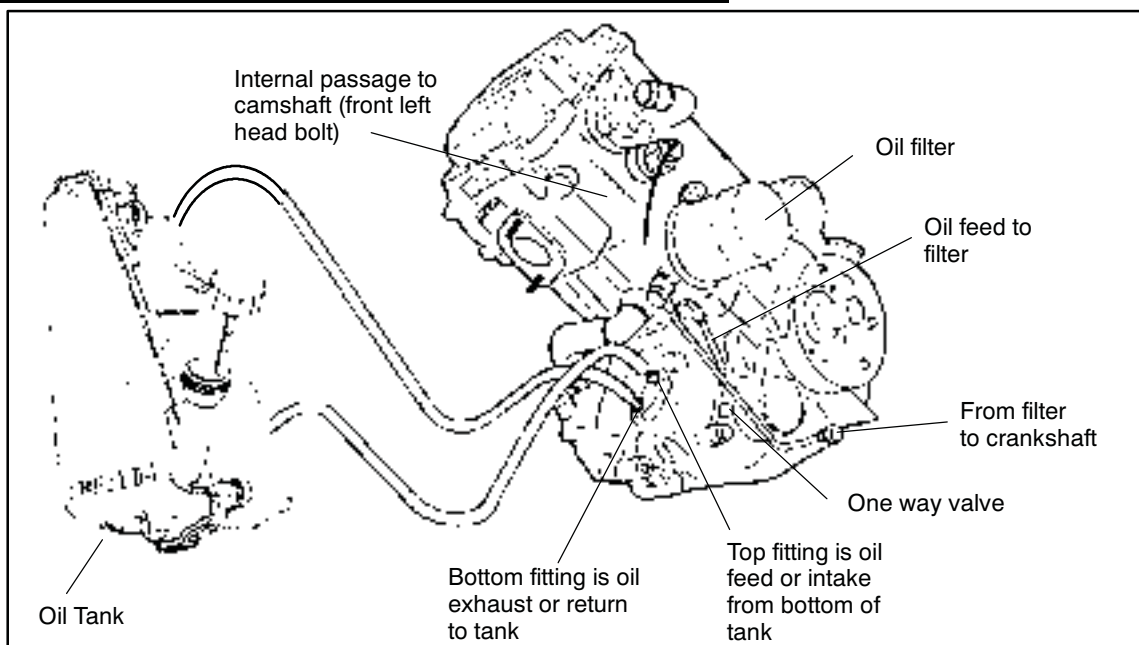
The other oil path from the filter leads through a delivery pipe to the crankcase main oil gallery, which leads to the stator plate oil passage. Here it passes through the slotted friction bearing (located in the stator plate) into the crankshaft. An oil seal on the stator plate prevents oil from entering the stator/flywheel area. Oil travels through the crankshaft to the crank pin, lubricating the connecting rod large end bearing directly. Oil also passes through an oil jet (drilled orifice) in the end of the crank pin to the PTO end main bearings and counterbalancer gears.

Residual oil from the lubrication of the crankshaft and connecting rod indirectly lubricates the cylinder wall, piston, rings, connecting rod small end bearing, piston pin, oil/water pump drive gears, cam chain and drive sprocket, and Magneto end crankshaft main bearing.

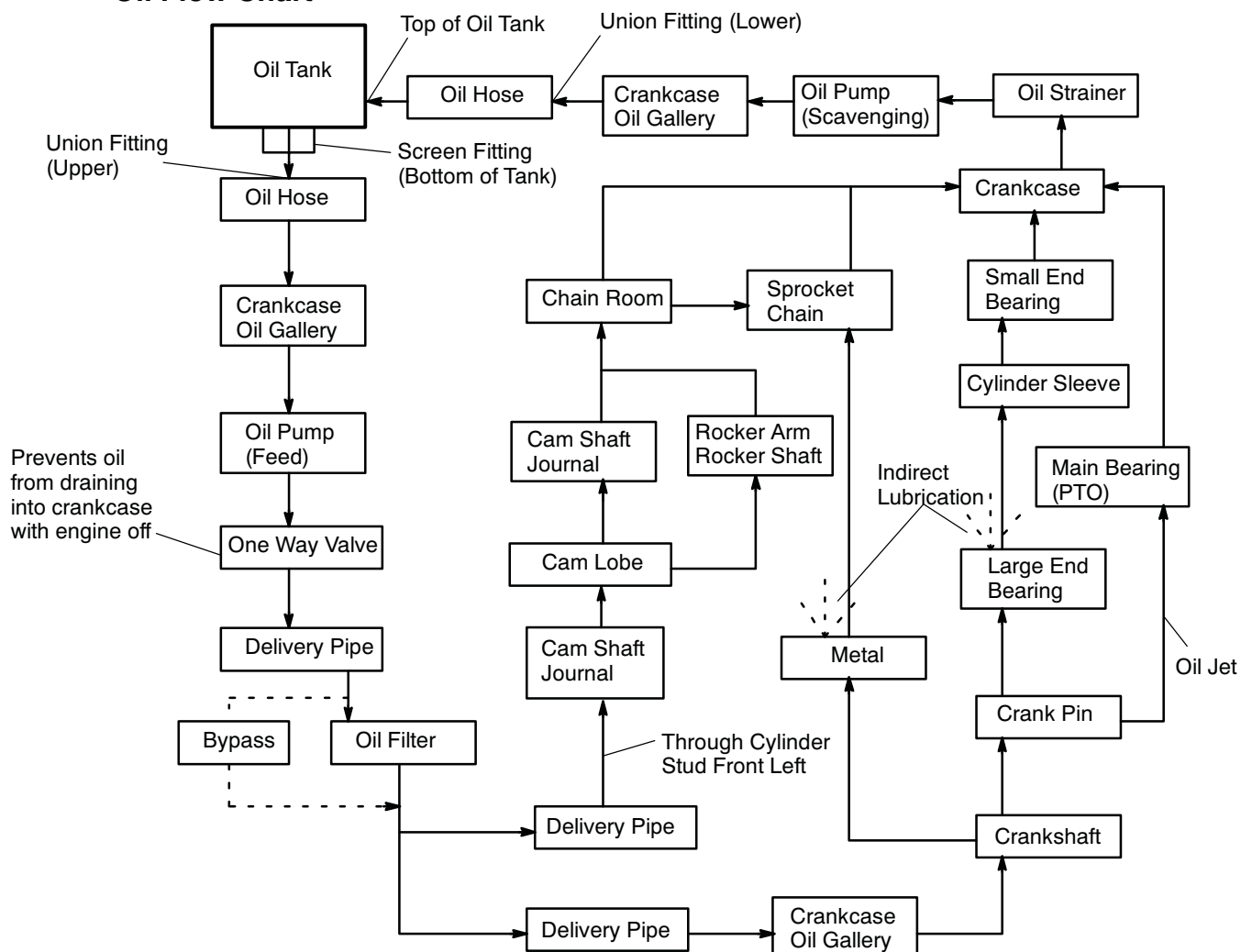
The one-way valve is located on the front left (PTO) side of the crankcase. The valve prevents oil in the tank from draining into the engine sump when the engine is off. The valve mechanism consists of a plunger, return spring, guide plug, and sealing washer. When the engine is running, oil pressure lifts the plunger off the seat, allowing oil flow. When the engine is off, spring pressure forces the plunger against the oil passage seat, preventing oil flow from the tank to the sump. The one-way valve requires very little maintenance. If engine oil drains into the sump when the engine is off, inspect the valve sealing surface for debris or damage. Inspect the return spring for distortion or damage.



EH42PL/EH50PL OIL FLOW DIAGRAM



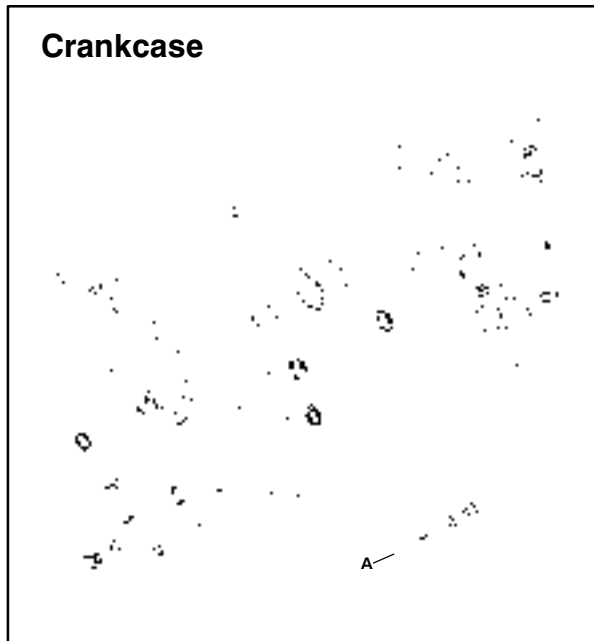
Oil Flow Chart



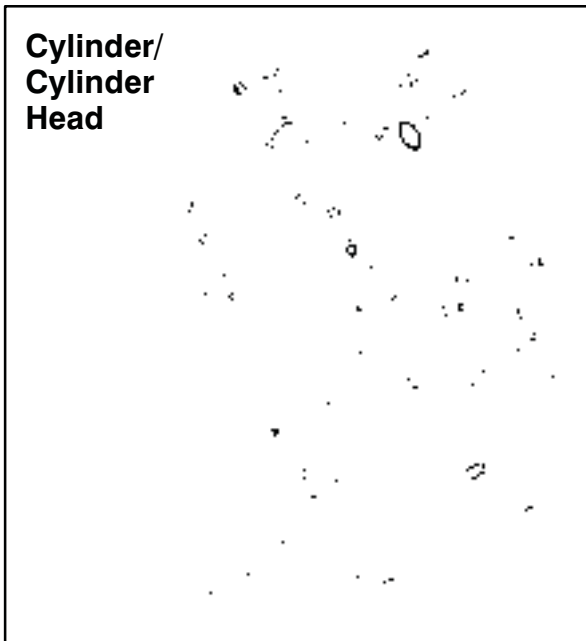


EH42PL/EH50PL ENGINE EXPLODED VIEW

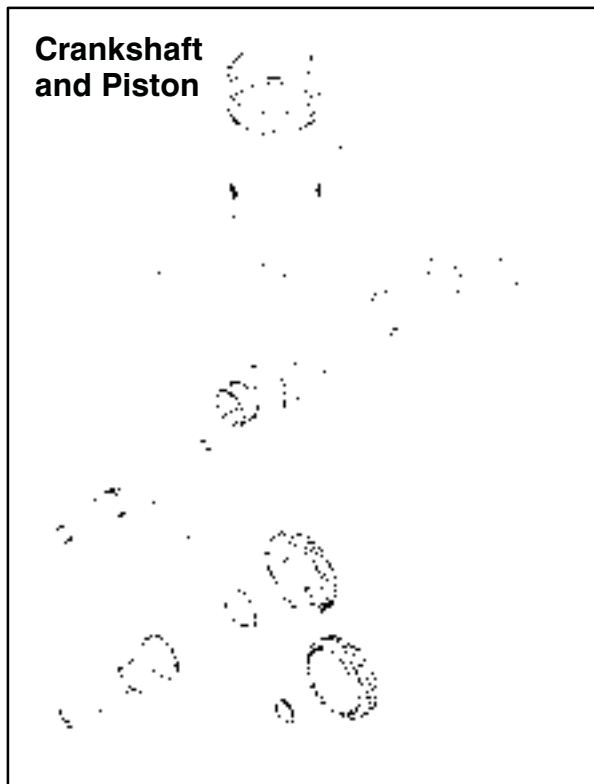
Crankcase



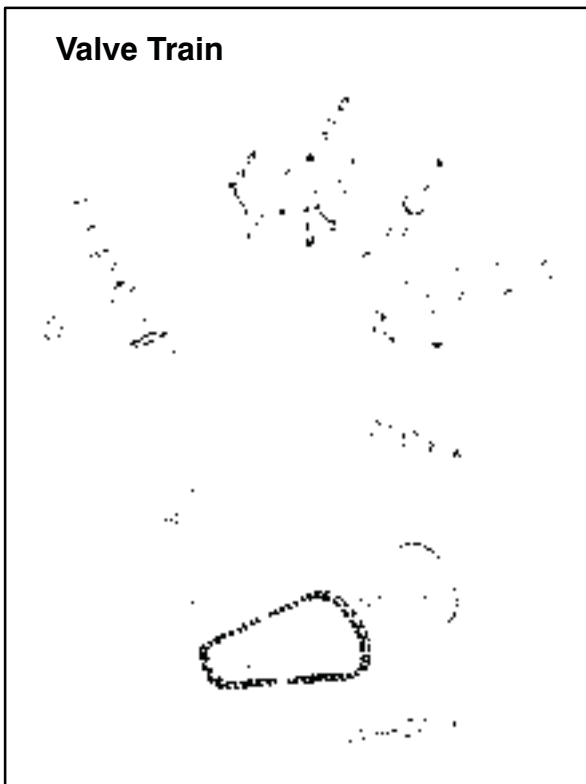
**Cylinder/
Cylinder
Head**



**Crankshaft
and Piston**



Valve Train



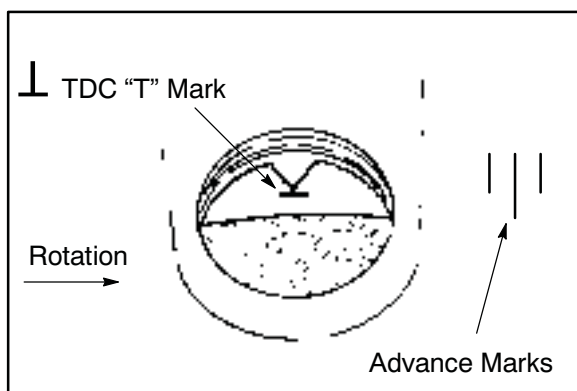


ENGINE REMOVAL

REFER TO PAGE 3.7-3.8 FOR ENGINE REMOVAL / INSTALLATION NOTES.

CAM CHAIN TENSIONER/ROCKER ARM/CAMSHAFT REMOVAL

1. Remove ignition timing inspection plug from recoil housing.



To position crankshaft at Top Dead Center (TDC) on compression stroke:

2. Rotate engine slowly in the direction of rotation watching intake valves open and start to close.
3. Continue to rotate engine slowly, watching camshaft sprocket marks and the mark in the timing inspection hole.



4. Align single (TDC) mark on flywheel with projection in inspection hole, and the cam sprocket pin (facing upward) aligned with the camshaft to crankshaft center line. **NOTE:** The cam lobe should be pointing down and valves

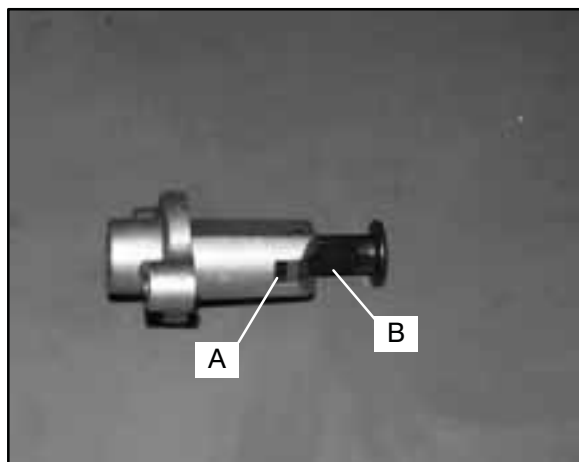
should have clearance at this point.



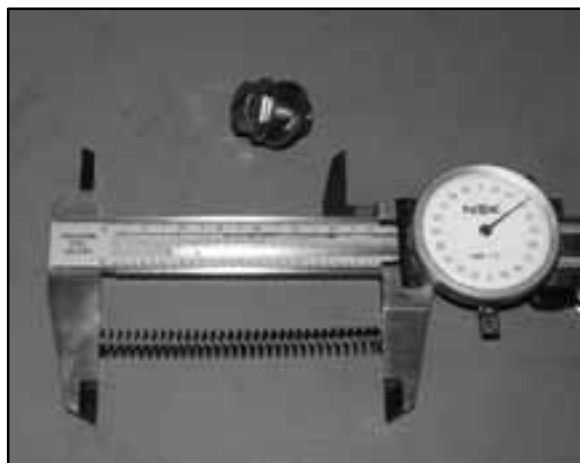
5. Remove cam chain tensioner plug, sealing washer, and spring. **CAUTION:** The plug is under spring tension. Maintain inward pressure while removing.
6. Remove the two 6x25 mm cam chain tensioner flange bolts.
7. Tap lightly on tensioner body with a soft face hammer and remove tensioner.



CAM CHAIN TENSIONER INSPECTION



1. Pull cam chain tensioner plunger outward to the end of its travel. Inspect teeth on ratchet pawl (A) and plunger teeth (B) for wear or damage.
2. Push ratchet pawl and hold it. The plunger should move smoothly in and out of the tensioner body.
3. Release ratchet pawl and push inward on plunger. It should remain locked in position and not move inward.



Tensioner Spring Free Length:

2.320" (5.9 cm)

4. Measure free length of tensioner spring. Replace spring if excessively worn. Compare to specifications.
5. Replace entire tensioner assembly if any part is worn or damaged.

ROCKER ARM/SHAFT INSPECTION



1. Mark or tag rocker arms to keep them in order for assembly.
2. Inspect each rocker arm cam follower surface. If there is any damage or uneven wear, replace the rocker arm. **NOTE:** Always inspect camshaft lobe if rocker arms are worn or damaged.



3. Measure O.D. of rocker shaft. Inspect it for wear or damage. Compare to specifications.

Rocker Shaft O.D.:

.8656-.8661" (21.987-22.0 mm)

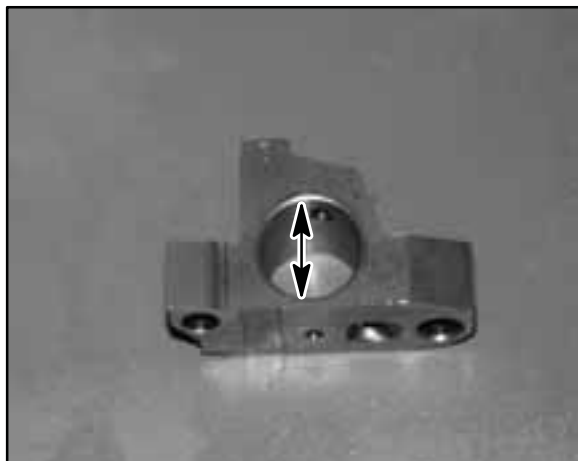


ROCKER ARM/SHAFT INSPECTION, CONT.



Rocker Arm & Support I.D.:
.8669-.8678" (22.020-22.041 mm)

4. Measure I.D. of each rocker arm and compare to specifications.



Rocker Shaft Oil Clearance:

Std: .0008-.0021" (.020-.054 mm)
Limit: .0039" (.10 mm)

5. Measure I.D. of both rocker arm shaft supports and visually inspect surface. Compare to specifications.
6. Subtract rocker shaft O.D. from rocker arm & shaft support I.D. This is the oil clearance. Compare to specifications.
7. Inspect rocker adjuster screws for wear, pitting, or damage to threads of the adjuster or locknut. Replace all worn or damaged parts. **NOTE:** The end of the adjuster screw is hardened and cannot be ground or re-faced.

CAMSHAFT REMOVAL



1. Remove thermostat housing.
2. Remove camshaft sprocket inspection cover.



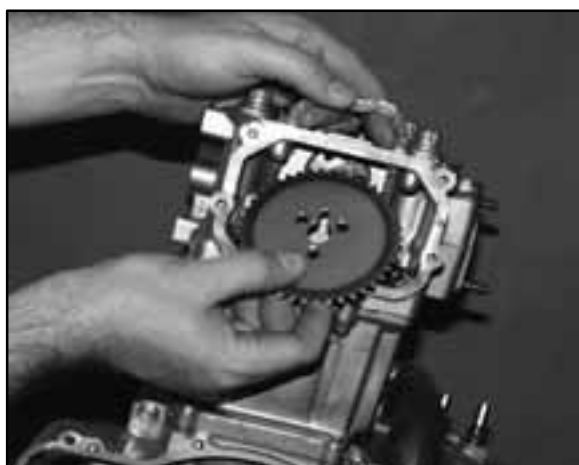
3. Loosen three camshaft sprocket bolts.



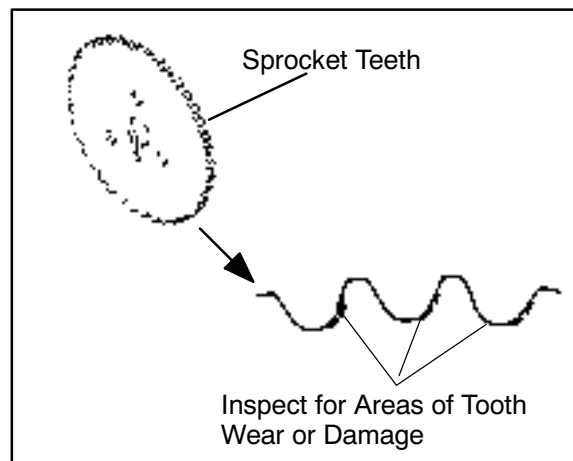
4. Remove camshaft end cap and O-Ring.



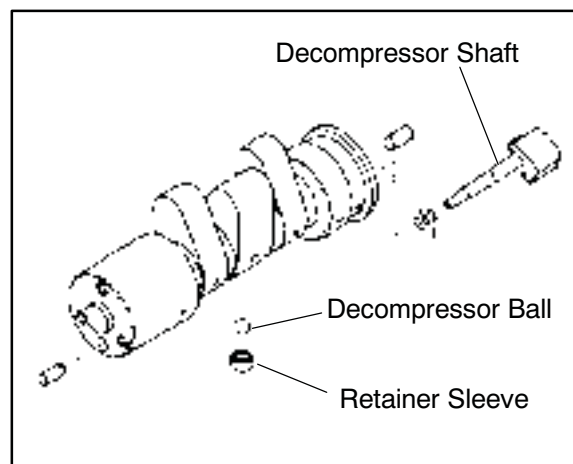
5. Inspect camshaft end cap (thrust face) for wear. Replace if worn or damaged.
6. Place a clean shop towel in the area below cam chain sprocket and remove sprocket retaining bolts.



7. Slide camshaft inward to allow removal of cam sprocket and remove sprocket from camshaft and chain.
8. Secure cam chain with a wire to prevent it from falling into the crankcase.



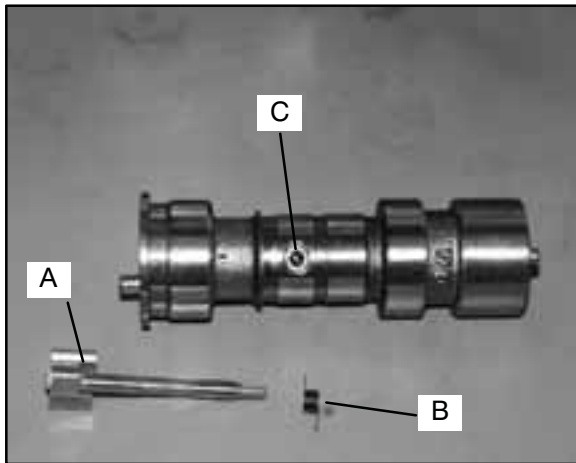
9. Inspect cam sprocket teeth for wear or damage. Replace if necessary.



10. Slide camshaft out the PTO side of the cylinder head.

AUTOMATIC COMPRESSION RELEASE REMOVAL/INSPECTION

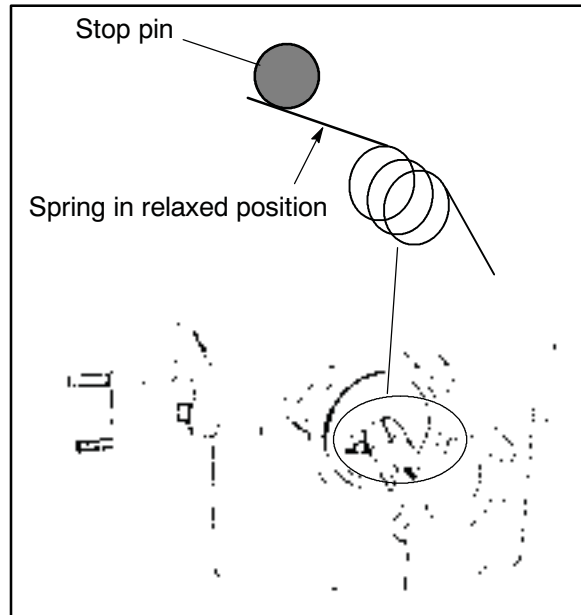
NOTE: The automatic compression release mechanism can be inspected and serviced without removing the camshaft from the cylinder head. The actuator ball in the camshaft is not replaceable. Replace the camshaft as an assembly if the actuator ball is worn or damaged.



1. Check release lever shaft (A) for smooth operation throughout the entire range of rotation. The spring (B) should hold the shaft weight against the stop pin. In this position, the actuator ball (C) will be held outward in the compression release mode.
2. Remove release lever shaft and return spring.
3. Inspect shaft for wear or galling.
4. Inspect lobe on end of release lever shaft and actuator ball for wear and replace if necessary.

AUTOMATIC COMPRESSION RELEASE INSTALLATION

1. Slide spring onto shaft.
 2. Apply engine oil to release lever shaft.
- The actuator ball must be held outward to allow installation of the release lever shaft.



If Camshaft Is Removed From Engine:

3. Turn the camshaft until the actuator ball is in the lowest position and install the release lever shaft.

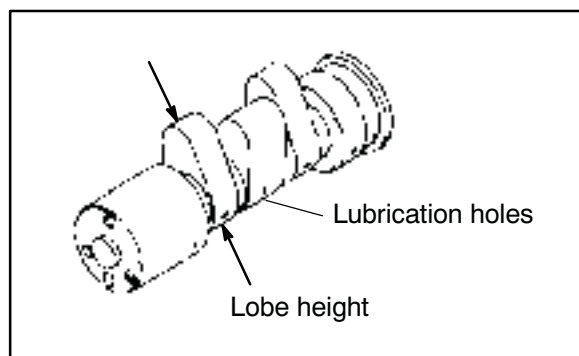
If Camshaft Is Installed In The Engine:

4. Use a small magnet to draw the actuator ball outward, or rotate the engine until the cam lobes face upward and install release lever shaft.
5. Position camshaft as shown at bottom of illustration at right.
6. Place arm of spring under stop pin as shown and push release lever inward until fully seated. *Do not* pre-wind the spring one full turn or the compression release will not disengage when the engine starts. Check operation of mechanism as outlined in Step 1 of Removal (above).

NOTE: When shaft is properly installed, actuator ball will be held in the "out" position. It is important to note that spring pressure is very light.

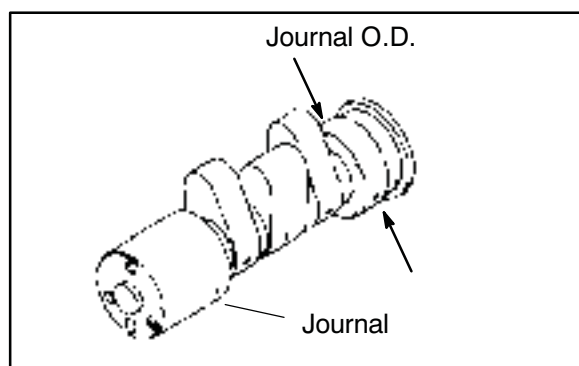
CAMSHAFT INSPECTION

1. Visually inspect each cam lobe for wear, chafing or damage.
2. Thoroughly clean the cam shaft, making sure the oil feed holes are not obstructed.

**Cam Lobe Height (Intake & Exhaust):**

Std: 1.2884-1.2924" (32.726-32.826 mm)
Limit: 1.2766" (32.426 mm)

3. Measure height of each cam lobe using a micrometer. Compare to specifications.

**Camshaft Journal O.D.:**

Mag & PTO End: 1.4935-1.4941"
(37.935-37.950 mm)

4. Measure camshaft journal outside diameter (O.D.)
5. Measure ID of camshaft journal bore.

Camshaft Journal I.D.:

Mag & PTO End: 1.4963-1.4970"
(38.005-38.025 mm)

Calculate oil clearance by subtracting journal OD from journal bore ID. Compare to specifications.

Camshaft Oil Clearance:

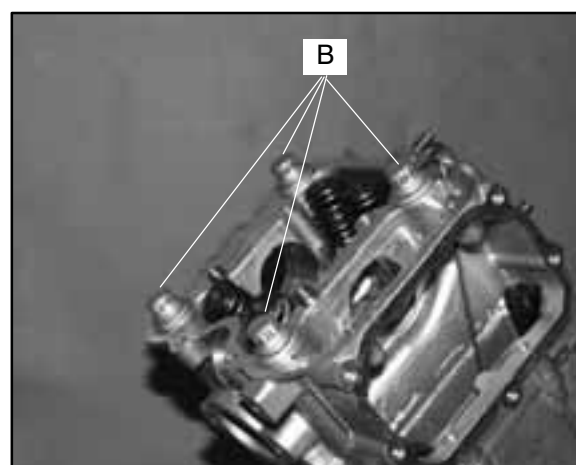
Std: .0022-.0035" (.055-.090 mm)
Limit: .0039" (.10 mm)

NOTE: Replace camshaft if damaged or if any part is worn past the service limit.

NOTE: Replace cylinder head if camshaft journal bore is damaged or worn excessively.

CYLINDER HEAD EXPLODED VIEW, EH42PL/EH50PL

1. Remove the two 6mm flange bolts (A) from cylinder head. See next exploded view on next page.
2. Loosen each of the four cylinder head bolts evenly 1/8 turn each time in a criss-cross pattern until loose.

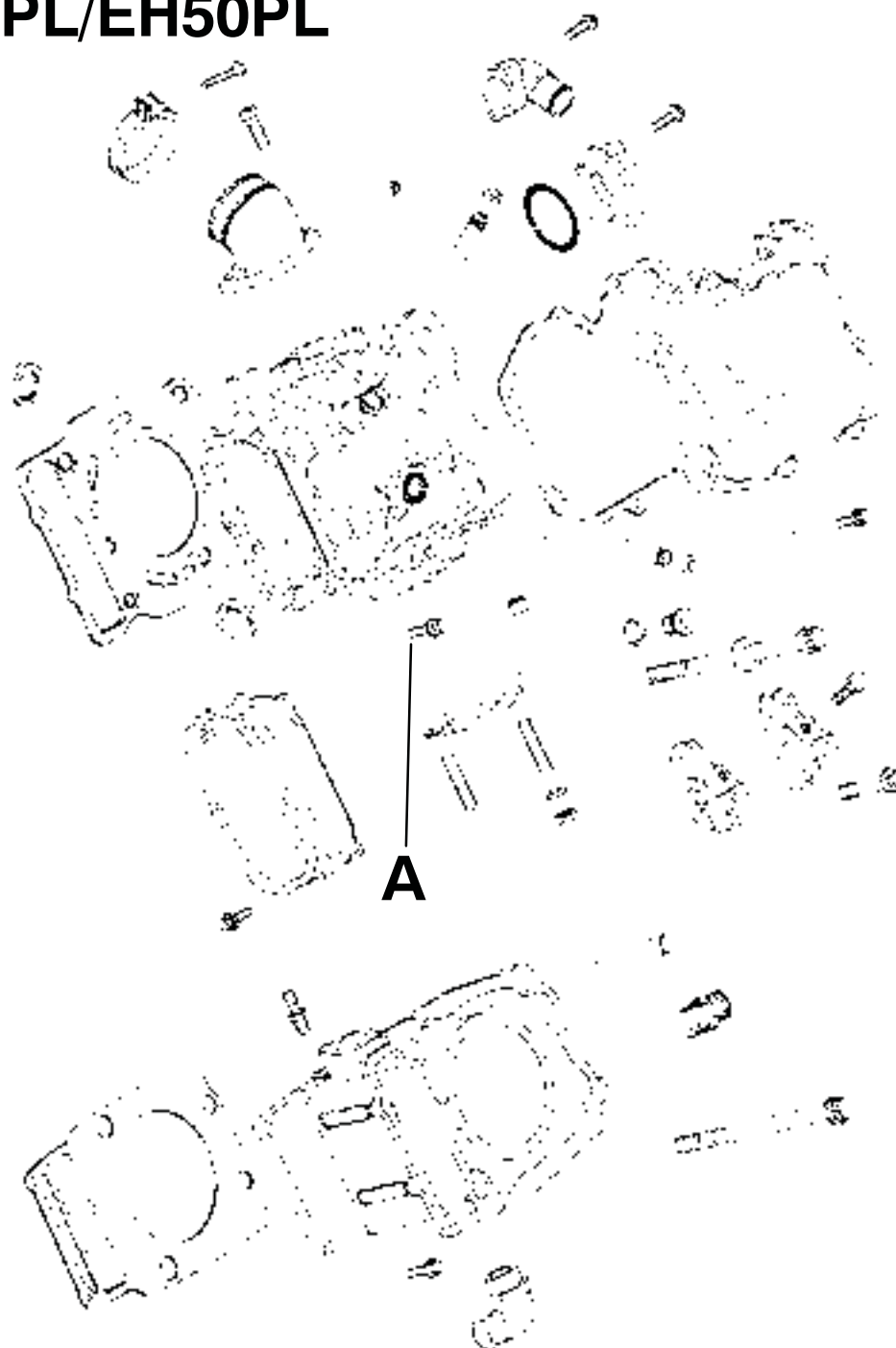


3. Remove bolts (B) and tap cylinder head lightly with a plastic hammer until loose. **CAUTION:** Tap only in reinforced areas or on thick parts of cylinder head casting to avoid damaging the thread.
4. Remove cylinder head and head gasket.



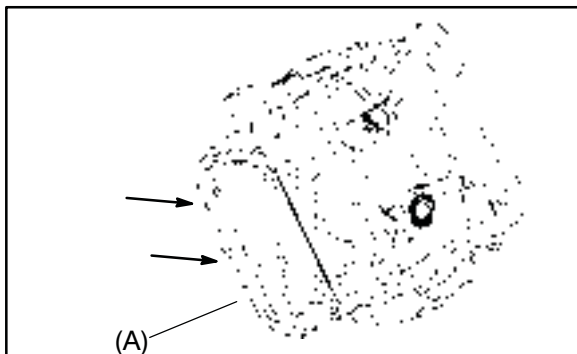
CYLINDER HEAD EXPLODED VIEW, EH42PL/EH50PL

EH42PL/EH50PL





CYLINDER HEAD INSPECTION



1. Thoroughly clean cylinder head (A) surface to remove all traces of gasket material and carbon.
CAUTION: Use care not to damage sealing surface.

CYLINDER HEAD WARPAGE



Cylinder Head Warpage Limit:

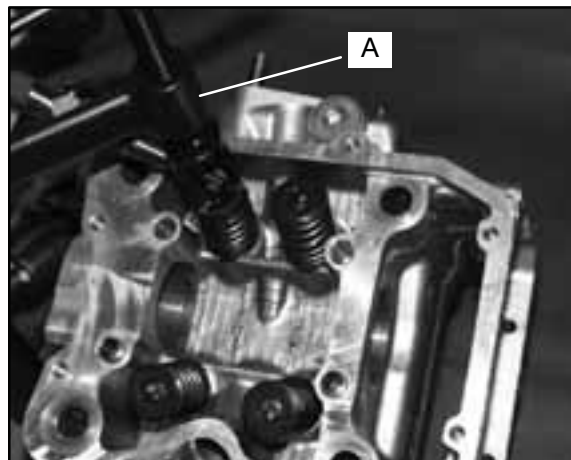
.002" (.05 mm)

1. Lay a straight edge across the surface of the cylinder head at several different points and measure warpage by inserting a feeler gauge between the straight edge and the cylinder head surface. If warpage exceeds the service limit, replace the cylinder head.

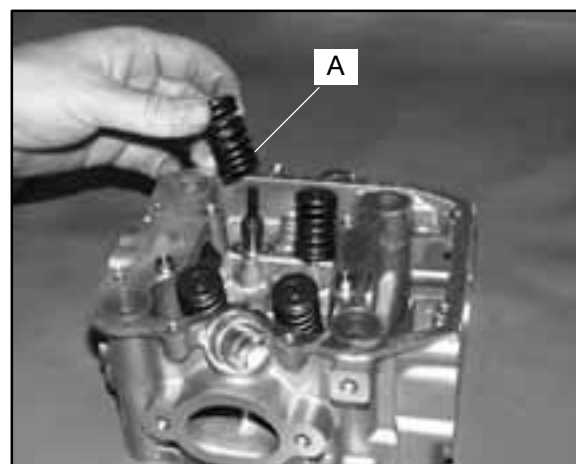
CYLINDER HEAD DISASSEMBLY

WARNING: Wear eye protection or a face shield during cylinder head disassembly and reassembly.

NOTE: Keep all parts in order with respect to their location in the cylinder head.



1. Using a valve spring compressor (A), compress the valve spring and remove the split keeper.
NOTE: To prevent loss of tension, do not compress the valve spring more than necessary.



2. Remove spring retainer and spring.

NOTE: The valve springs should be positioned with the tightly wound coils against the cylinder head on progressively wound springs (A).

3. Push valve out, keeping it in order for reassembly in the same guide.



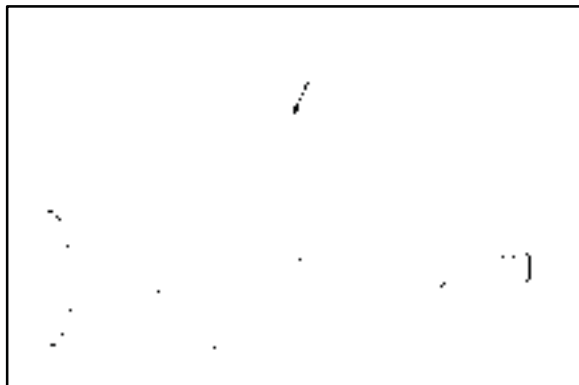
4. Measure free length of spring with a Vernier caliper. Check spring for squareness. Compare to specifications. Replace spring if either measurement is out of specification



5. Remove valve seals. **CAUTION:** Replace seals whenever the cylinder head is disassembled. Hardened, cracked or worn valve seals will cause excessive oil consumption and carbon buildup.

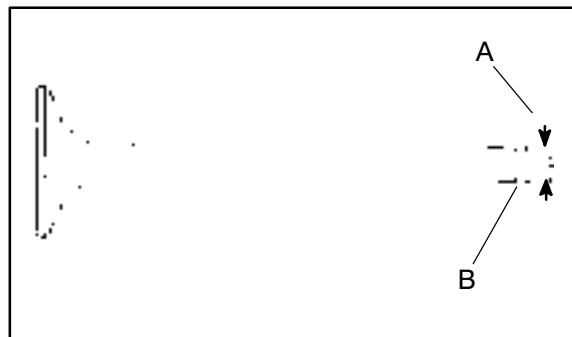
VALVE INSPECTION

1. Remove all carbon from valve with a soft wire wheel.

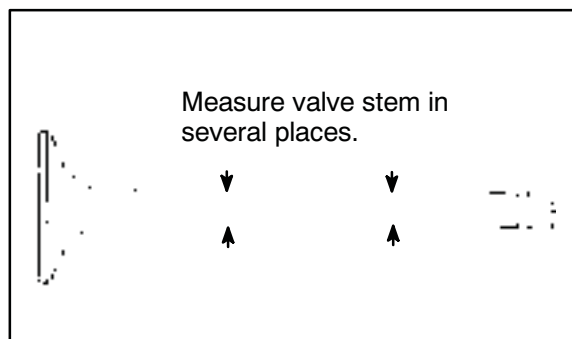


2. Check valve face for runout, pitting, and burnt spots. To check for bent valve stems, mount valve in a drill or use "V" blocks and a dial

indicator.



3. Check end of valve stem for flaring, pitting, wear or damage (A).
4. Inspect split keeper groove for wear or flaring of the keeper seat area (B). **NOTE:** The valves cannot be re-faced or end ground. They must be replaced if worn, bent, or damaged.

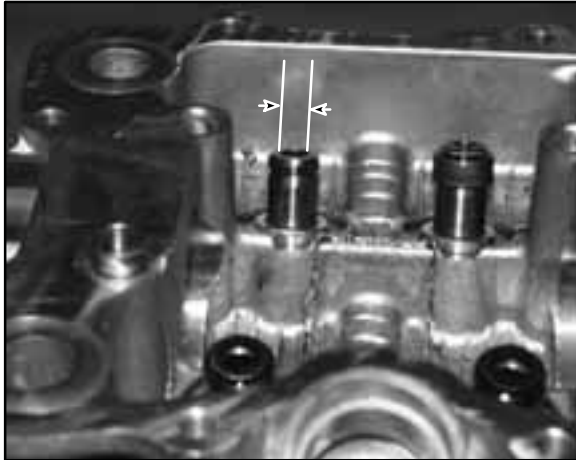


Valve Stem Diameter:

Intake: .2343-.2348" (5.950-5.965 mm)

Exhaust: .2341-.2346" (5.945-5.960 mm)

5. Measure diameter of valve stem with a micrometer in three places and in two different directions (six measurements total). Compare to specifications.



Valve Guide I.D.:
.2362-.2367" (6.0-6.012 mm)

6. Measure valve guide inside diameter at the top middle and end of the guide using a small hole gauge and a micrometer. Measure in two directions, front to back and side to side.
7. Subtract valve stem measurement to obtain stem to guide clearance. **NOTE:** Be sure to measure each guide and valve combination individually.
8. Replace valve and/or guide if clearance is excessive. Compare to specifications.

NOTE: If valve guides are replaced, valve seats must be reconditioned. Refer to Valve Seat Reconditioning for procedure.

COMBUSTION CHAMBER



Clean all accumulated carbon deposits from combustion chamber and valve seat area with a soft wire brush.

VALVE SEAT RECONDITIONING

Valve Seat Inspection

Inspect valve seat in cylinder head for pitting, burnt spots, roughness, and uneven surface. If any of the above conditions exist, the valve seat must be reconditioned. See Valve Seat Reconditioning, Page 3.25. *If the valve seat is cracked the cylinder head must be replaced.*

Cylinder Head Reconditioning

NOTE: Servicing the valve guides and valve seats requires special tools and a thorough knowledge of reconditioning techniques. Follow the instructions provided in the cylinder head service tool kit.

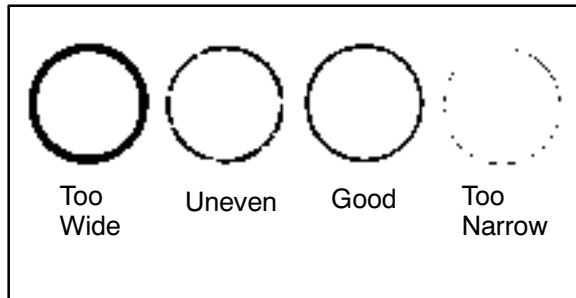
CAUTION: Wear eye protection when performing cylinder head service. Valve guide replacement will require heating of the cylinder head. Wear gloves to prevent burns.

Valve Guide Removal/Installation

1. Remove all carbon deposits from the combustion chamber, valve seat and valve guide area before attempting to remove valve guides. **CAUTION:** Carbon deposits are extremely abrasive and may damage the valve guide bore when guides are removed.
2. Place new valve guides in a freezer for at least 15 minutes while heating cylinder head.
3. Heat cylinder head in an oven or use a hot plate to bring cylinder head temperature to 212° F (100° C). **CAUTION:** Do not use a torch to heat cylinder head or warpage may result from uneven heating. Head temperature can be checked with a pyrometer or a welding temperature stick.

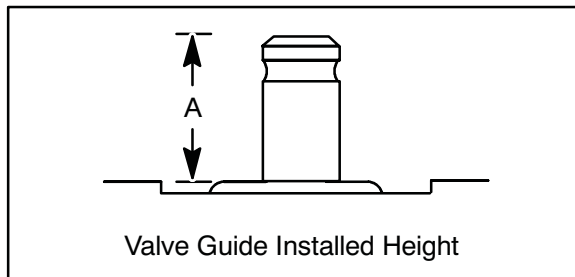
VALVE SEAT RECONDITIONING, CONT.

Follow the manufacturers instructions provided with the valve seat cutters in the Valve Seat Reconditioning Kit (PN 2200634). Abrasive stone seat reconditioning equipment can also be used. Keep all valves in order with their respective seat.



NOTE: Valve seat width and point of contact on the valve face is very important for proper sealing. The valve must contact the valve seat over the entire circumference of the seat, and the seat must be the proper width all the way around. If the seat is uneven, compression leakage will result. If the seat is too wide, seat pressure is reduced, causing carbon accumulation and possible compression loss. If the seat is too narrow, heat transfer from valve to seat is reduced and the valve may overheat and warp, resulting in burnt valves.

1. When thoroughly heated, place cylinder head on blocks of wood which will allow the old guides to be removed.
2. Using valve guide driver, drive guides out of the cylinder head from the combustion chamber side. Be careful not to damage guide bore or valve seat when removing guides.
3. Place cylinder head on cylinder head table.
NOTE: Be sure cylinder head is still at 212° F (100° C) before installing new guides.



Valve Guide Height:
.689-.709" (17.5-18.0 mm)

4. Place a new guide in the valve guide installation tool and press guide in to proper depth. Check height of each guide above the cylinder head (A).
NOTE: The guide can also be driven in to the proper depth. Inspect the guide closely for cracks or damage if a driver is used.

Reaming The Valve Guide



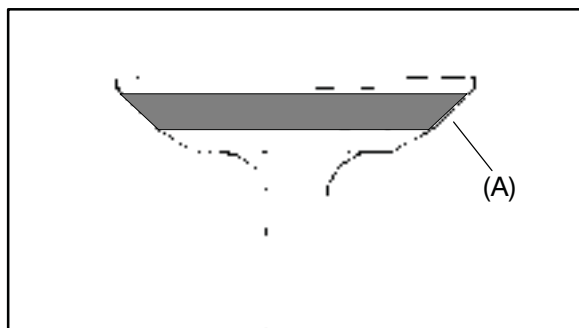
5. Allow cylinder head to cool to room temperature. Apply cutting oil to the reamer. Guides should be reamed from the valve spring side of the cylinder head. Ream each guide to size by turning the reamer clockwise continually. Continue to rotate reamer clockwise during removal of the tool.
6. Clean guides thoroughly with hot soapy water and a nylon brush. Rinse and dry with compressed air. Apply clean engine oil to guides.
7. Install pilot into valve guide.
8. Apply cutting oil to valve seat and cutter.



9. Place 46° cutter on the pilot and make a light cut.
10. Inspect the cut area of the seat.
 - If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.
 - If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.



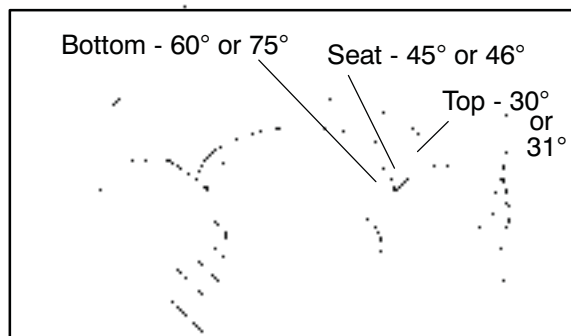
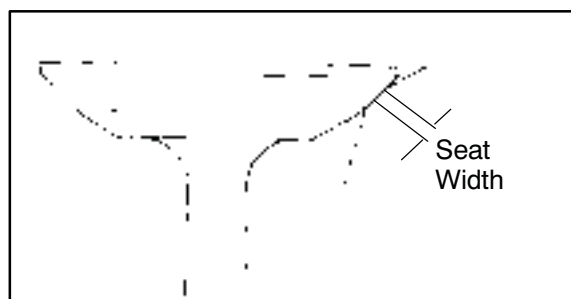
- If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation and must be replaced. Be sure the cylinder head is at the proper temperature and replace the guide.
- If the contact area of the initial cut is greater than 75%, continue to cut the seat until all pits are removed and a new seat surface is evident. **NOTE:** Remove only the amount of material necessary to repair the seat surface.



11. To check the contact area of the seat on the valve face, apply a thin coating of Prussian Blue™ paste to the valve seat. If using an interference angle (46°) apply black permanent marker to the entire valve face (A).
12. Insert valve into guide and tap valve lightly into place a few times.
13. Remove valve and check where the Prussian Blue™ indicates seat contact on the valve face. The valve seat should contact the middle of the valve face or slightly above, and must be the proper width.
 - If the indicated seat contact is at the top edge of the valve face and contacts the margin area(B) it is too high on the valve face. Use the 30° cutter to lower the valve seat.
 - If too low use the 60° or 75° cutter to raise the seat. When contact area is centered on the valve face, measure seat width.
 - If the seat is too wide or uneven, use both top and bottom cutters to narrow the seat.
 - If the seat is too narrow, widen using the 45° cutter and re-check contact point on the valve face and seat width after each cut.

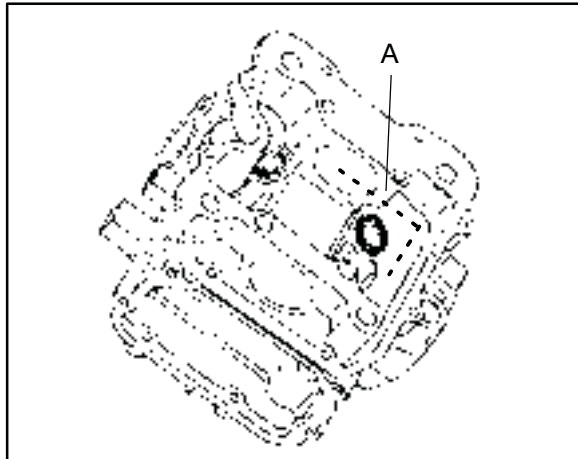
Valve Seat Width:

Intake Std: .028" (.7 mm)
Limit: .055" (1.4 mm)
Exhaust Std: .039" (1.0 mm)
Limit: .071" (1.8 mm)



NOTE: When using an interference angle, the seat contact point on the valve will be very narrow, and is a normal condition. Look for an even and continuous contact point on the black marker, all the way around the valve face.

14. Clean all filings from the area with hot soapy water, rinse, and dry with compressed air.
15. Lubricate the valve guides with clean engine oil, and apply oil or water based lapping compound to the face of the valve. Lapping is not required with an interference angle.
16. Insert the valve into its respective guide and lap using a lapping tool or a section of fuel line connected to the valve stem.
17. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do this four to five times until the valve is fully seated, and repeat process for the other valve(s).



18. Clean cylinder head, valves, and camshaft oil supply passage (A) thoroughly.
19. If oil passage blind plug was removed, apply Crankcase Sealant (PN 2871557) or equivalent sealer to the threads and install, torquing to 8 ft. lbs. (11 Nm). **CAUTION:** Do not allow sealant to enter oil passage.
20. Spray electrical contact cleaner into oil passage and dry using compressed air.

CYLINDER HEAD ASSEMBLY

CAUTION: Wear eye protection during assembly.

NOTE: Assemble the valves one at a time to maintain proper order.



1. Install new valve seals on valve guides.
2. Apply engine oil to valve guides and seats.
3. Coat valve stem with molybdenum disulfide grease.
4. Install valve carefully with a rotating motion to avoid damaging valve seal.
5. Dip valve spring and retainer in clean engine oil and install spring with closely spaced coils toward the cylinder head.



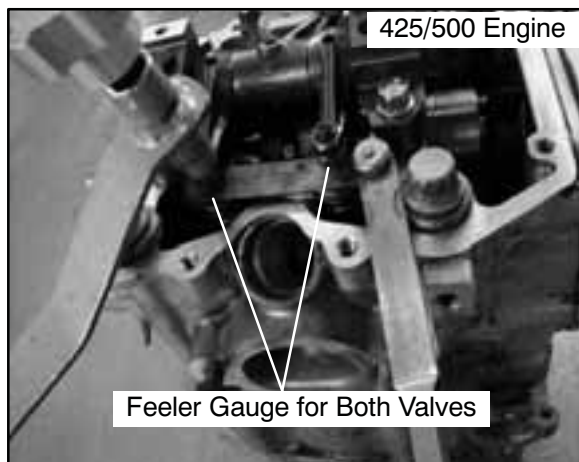
6. Place retainer on spring and install valve spring compressor. Compress spring only enough to allow split keeper installation to prevent loss of spring tension. Install split keepers with the gap even on both sides.
7. Repeat procedure for remaining valve.
8. When all valves are installed, tap lightly with soft faced hammer on the end of the valves to seat the split keepers.

VALVE SEALING TEST

1. Clean and dry the combustion chamber area.
2. Pour a small amount of clean, high flash point solvent into the intake port and check for leakage around each intake valve. The valve seats should hold fluid with no seepage.
3. Repeat for exhaust valves by pouring fluid into exhaust port.



EXHAUST VALVE CLEARANCE ADJUSTMENT



NOTE: The exhaust valves share a common rocker arm, and must be adjusted using two feeler gauges.

1. Insert .006 feeler gauge(s) between end of exhaust valve stem and adjuster screw(s).
2. Loosen locknut(s) and turn adjuster screw(s) until there is a slight drag on feeler gauge(s). The Valve/Clutch Adjuster Tool (**PA-44689**) can be used to adjust the 425/500 engines valves.
NOTE: Both feeler gauges should remain inserted during adjustment of each valve.

EXHAUST VALVE CLEARANCE

.006" (.15 mm)

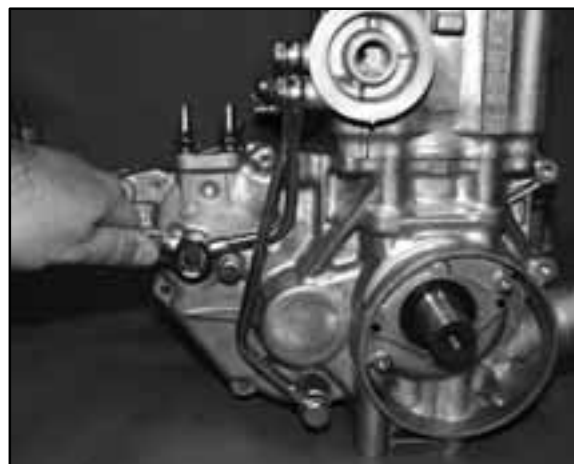
3. When clearance is correct, hold adjuster screw and tighten locknut securely
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

CYLINDER/PISTON REMOVAL AND INSPECTION

NOTE: Follow engine disassembly procedures to remove valve cover, camshaft and rocker arms, and cylinder head.



1. Remove cam chain guide at front of cylinder.



2. Loosen all four oil pipe banjo bolts and then remove the bolts and eight sealing washers. Remove the pipes.



3. Loosen hose clamps and remove coolant inlet hose.
4. Remove the two 6 mm cylinder base bolts.



5. Loosen each of the four large cylinder base bolts 1/4 turn at a time in a criss-cross pattern until loose and remove bolts.

NOTE: The bolts are inside the water jacket.



6. Tap cylinder lightly with a plastic hammer in the reinforced areas only until loose.
7. Rock cylinder forward and backward and lift it from the crankcase, supporting piston and connecting rod. Support piston with Piston Support Block (PN 2870390).
8. Remove dowel pins from crankcase.

PISTON REMOVAL



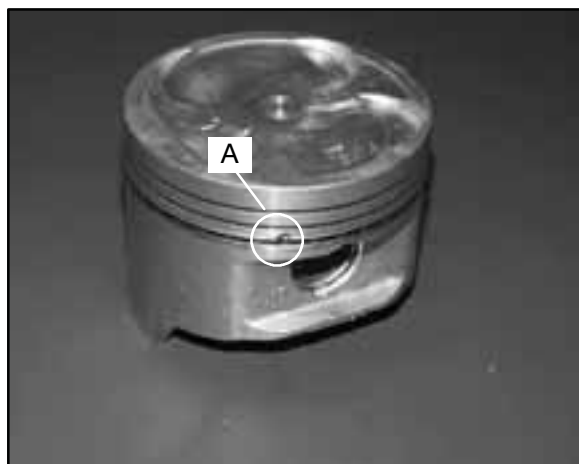
1. Remove circlip. Note piston directional arrow pointing toward the right (Mag) side of engine.
2. Remove piston circlip and push piston pin out of piston. If necessary, heat the crown of the piston *slightly* with a propane torch. **CAUTION:** Do not apply heat to the piston rings. The ring may lose radial tension.



3. Remove top compression ring.
***Using a piston ring pliers:** Carefully expand ring and lift it off the piston. **CAUTION:** Do not expand the ring more than the amount necessary to remove it from the piston, or the ring may break.
***By hand:** Placing both thumbs as shown, spread the ring open and push up on the opposite side. Do not



scratch the ring lands.



4. Repeat procedure for second ring.

The oil control ring is a three piece design consisting of a top and bottom steel rail and a center expander section. The top rail has a locating tab on the end which fits into a notch (A) in the upper oil ring land of the piston.

5. Remove the top rail first followed by the bottom rail.
6. Remove the expander.

CYLINDER INSPECTION

1. Remove all gasket material from the cylinder sealing surfaces.



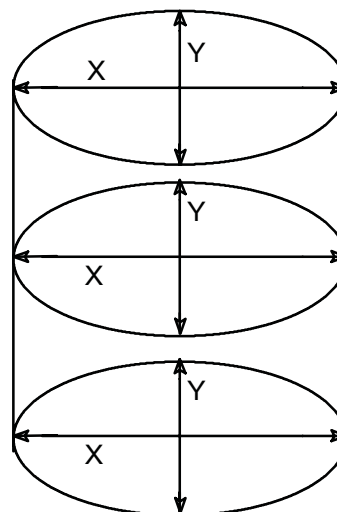
2. Inspect the top of the cylinder for warpage using a straight edge and feeler gauge.

Cylinder Warpage:

.002" (.05 mm)

3. Inspect cylinder for wear, scratches, or damage.

1/2" Down From Top of Cylinder



1/2" Up From Bottom

4. Inspect cylinder for taper and out of round with a telescoping gauge or a dial bore gauge. Measure in two different directions, front to back and side to side, on three different levels (1/2" down from top, in the middle, and 1/2" up from bottom).
5. Record measurements. If cylinder is tapered or out of round beyond .002, the cylinder must be re-bored oversize, or replaced.

Cylinder Taper

Limit: .002 Max.

Cylinder Out of Round

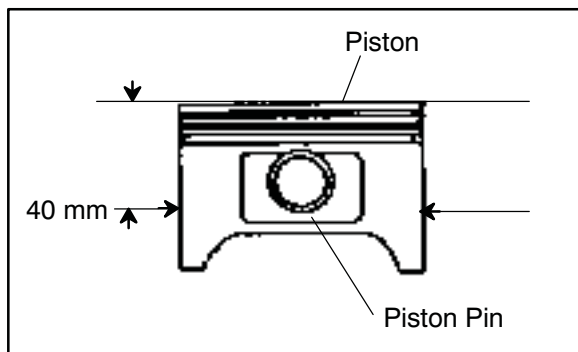
Limit: .002 Max.

Standard Bore Size:

3.6221-3.6228" (92.00-92.012mm)



PISTON-TO-CYLINDER CLEARANCE



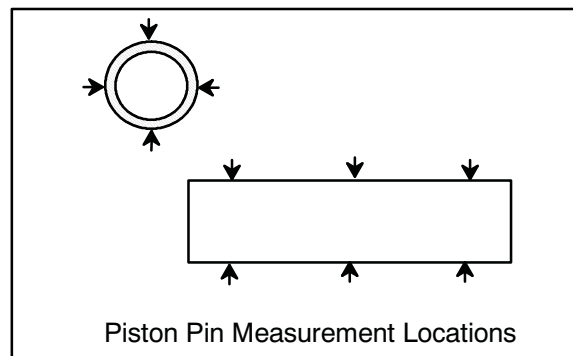
1. Measure piston outside diameter at a point 40 mm down from the top of the piston at a right angle to the direction of the piston pin.
2. Subtract this measurement from the maximum cylinder measurement obtained in Step 5 above.

Piston to Cylinder Clearance

Std: .0006-.0018" (.015-.045 mm)

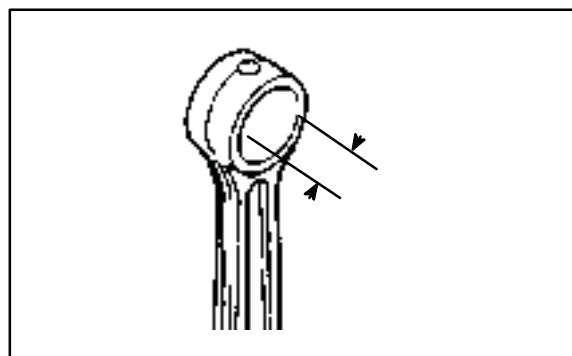
Piston O.D.:

Std: 3.6204-3.6215" (91.970-91.985 mm)



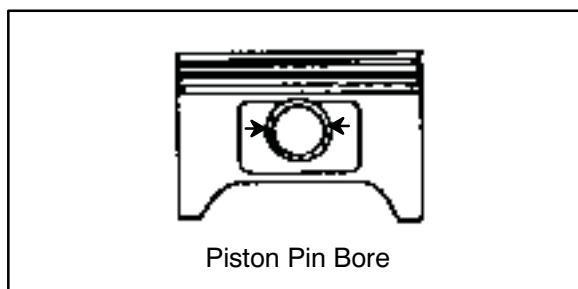
Piston Pin O.D.

.9053-.9055" (22.994-23.0 mm)



2. Measure piston pin O.D. Replace piston and/or piston pin if out of tolerance.
3. Measure connecting rod small end ID.

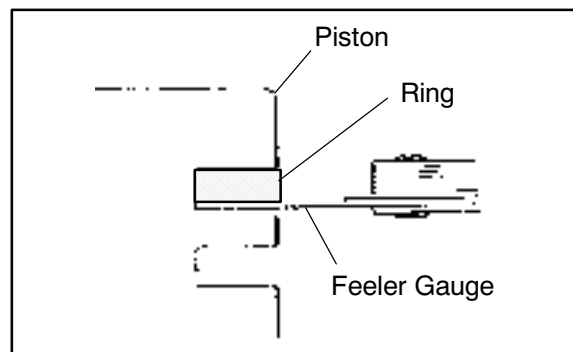
PISTON/ROD INSPECTION



Piston Pin Bore:

.9055-.9057" (23.0-23.006 mm)

1. Measure piston pin bore.

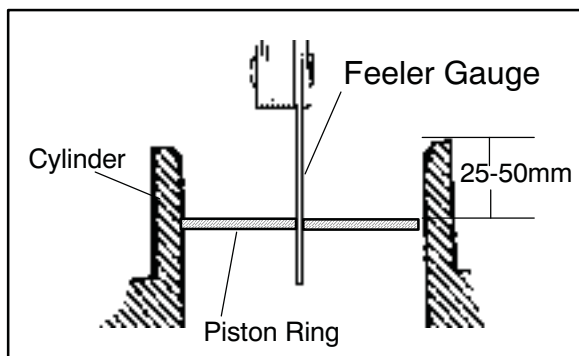


**Piston Ring-to-Groove Clearance****Top Ring Std: .0016-.0031" (.040-.080 mm)****Limit: .0059" (15 mm)****Second Ring Std: .0012-.0028" (.030-.070 mm)****Limit: .0059" (15 mm)**

4. Measure piston ring to groove clearance by placing the ring in the ring land and measuring with a thickness gauge. Replace piston and rings if ring-to-groove clearance exceeds service limits.

PISTON RING INSTALLED GAP

1. Place each piston ring inside cylinder using piston to push ring squarely into place as shown at right.

**Piston Ring Installed Gap****Top Ring****Std: .0079-.0138" (.20-.36 mm)****Limit: .039" (1.0 mm)****Second Ring****Std: .0079-.0138" (.20-.36 mm)****Limit: .039" (1.0 mm)****Oil Ring****Std: .0079-.0276" (.20-.70 mm)****Limit: .059" (1.5 mm)**

2. Measure installed gap with a feeler gauge at both the top and bottom of the cylinder. **NOTE:** A difference in end gap indicates cylinder taper. The cylinder should be measured for excessive taper and out of round.
3. If the *bottom* installed gap measurement exceeds the service limit, replace the rings. If ring gap is

below specified limit, file ring ends until gap is within specified range.

NOTE: Always check piston ring installed gap after re-boring a cylinder or when installing new rings. A re-bored cylinder should always be scrubbed thoroughly with hot soapy water, rinsed, and dried completely. Wipe cylinder bore with an oil rag immediately to remove residue and prevent rust.

CRANKCASE DISASSEMBLY

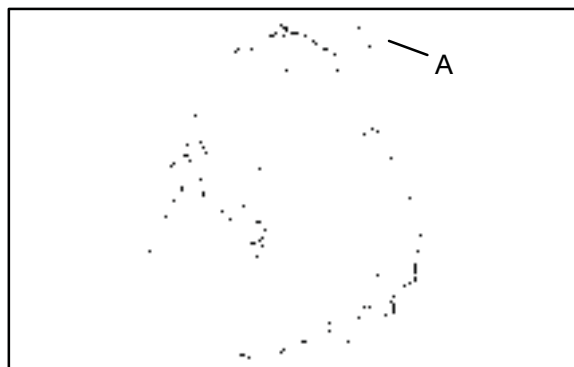
NOTE: The recoil starter, starter motor, starter drive, flywheel, stator, cam chain and sprockets can be serviced with the engine in the frame.

STARTER DRIVE REMOVAL/INSPECTION

1. Remove recoil housing bolts and remove housing.



2. Remove starter drive assembly. Note the thrust washer located at the rear of the drive mechanism.
3. Inspect the thrust washer for wear or damage and replace if necessary.





Std. Bushing ID:
 .4735"-.4740" (11.11-12.04 mm)

Std. Shaft OD:
 .470"-.472" (11.93-11.99 mm)

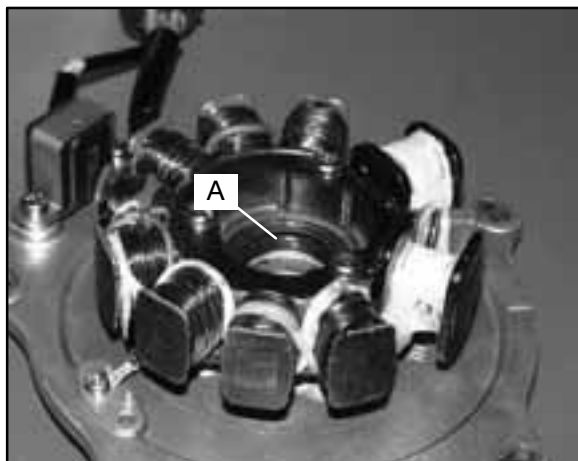
Starter Drive Bushing Clearance:
 Std: .0015"-.004" (.038-.102 mm)

Service Limit:
 .008" (.203 mm)

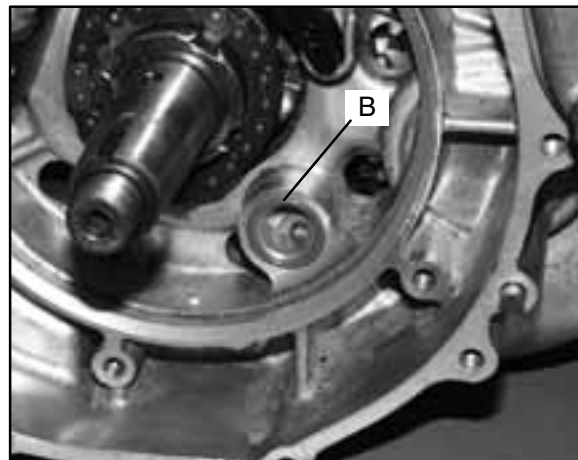
4. Measure the OD of the starter drive shaft on both ends and record.
5. Measure the ID of the bushing in the recoil housing (A) and in the crankcase and record. Measure in two directions 90° apart to determine if bushing is out of round. Calculate bushing clearance. Replace bushing if clearance exceeds the service limit.
6. Inspect gear teeth on starter drive. Replace starter drive if gear teeth are cracked, worn, or broken.

FLYWHEEL/STATOR REMOVAL/INSPECTION

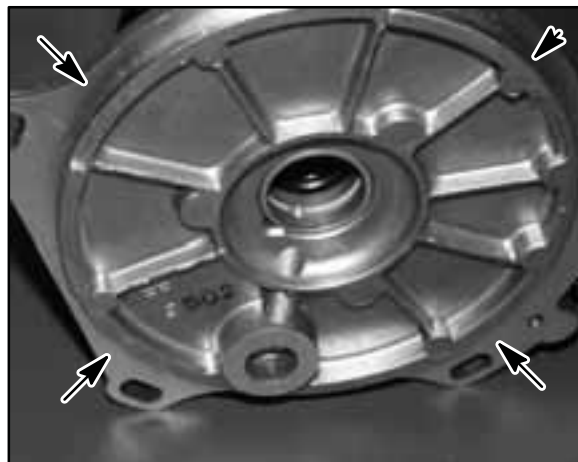
1. Remove flywheel nut and washer.
2. Install Flywheel Puller (PN 2871043) and remove flywheel. **CAUTION:** Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.
3. Mark or note position of stator plate on crankcase.
4. Remove bolts and carefully remove stator assembly, being careful not to damage crankshaft bushing on stator plate.



5. Replace crankshaft seal (A).



6. Remove oil passage O-Ring (B).



7. Remove large sealing O-Ring from outer edge of stator plate.

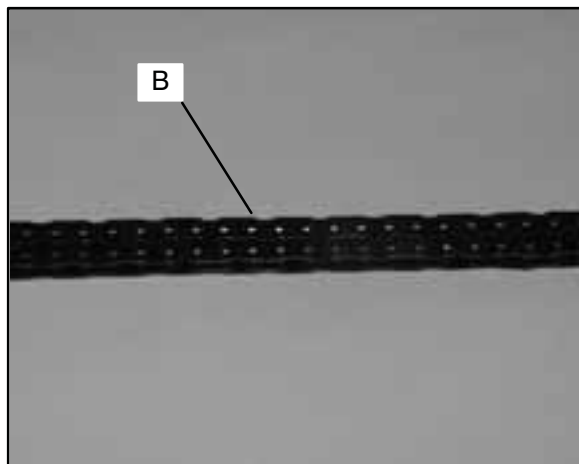
CAM CHAIN/TENSIONER BLADE



1. Remove bolt securing tensioner blade to crankcase (A).



2. Remove blade and inspect for cracks, wear, or damage.



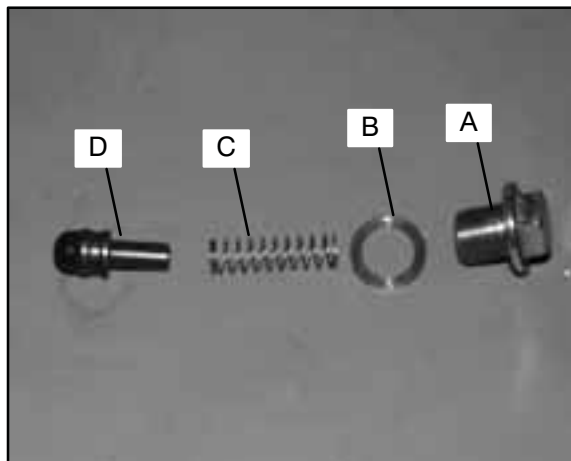
3. Remove cam chain (B). Inspect chain for worn or missing rollers or damage. Stretch chain tight on a flat surface and apply a 10 lb. (4.53 kg) load. Measure length of a 20 pitch section of chain. Replace if worn past service limit.

Chain Service Limit:
5.407" (13.7 cm)

4. Using the special socket, remove the crankshaft slotted nut (A). **NOTE:** The slotted nut is a left hand thread.
5. Remove cam chain drive sprocket (B) and Woodruff key from crankshaft.
6. Inspect sprocket teeth for wear or damage.
7. Inspect Woodruff key for wear.
8. Replace any worn or damaged parts.

ONE WAY VALVE

The one way valve prevents oil from draining out of the oil tank and into the crankcase when the engine is off. It must be clean and have adequate spring pressure in order to seal properly.



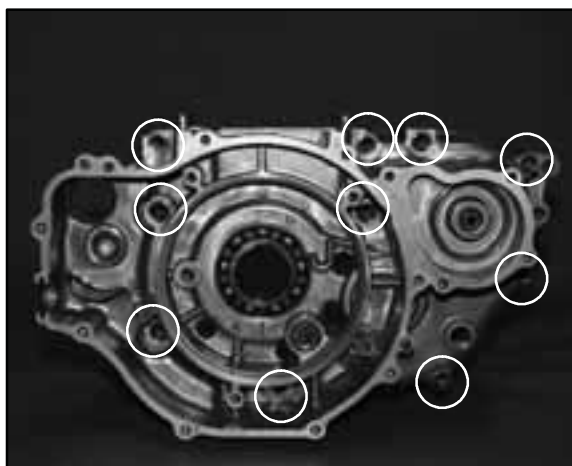
1. Remove cap bolt (A), sealing washer (B), spring (C), and one way valve (D) from PTO side crankcase.
2. Inspect free length of spring and check coils for distortion.

One Way Valve Spring Free Length:

Std: 1.450" (3.68 cm)

3. Inspect valve for wear.
4. Check seat area for nicks or foreign material that may prevent proper sealing of valve.

CRANKCASE SEPARATION



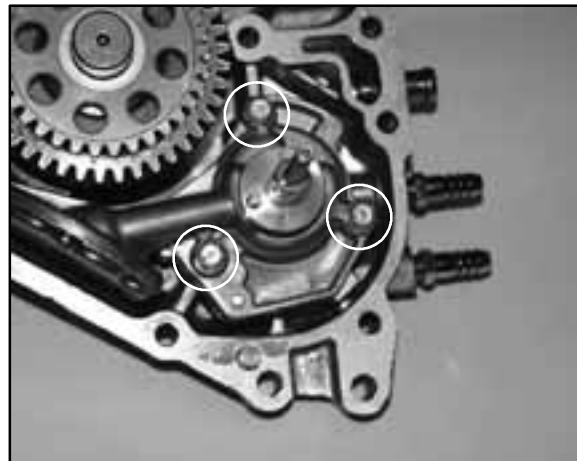
1. Remove flange bolts (10) from magneto side crankcase evenly in a criss-cross pattern.



2. Separate crankcase by tapping with a soft faced hammer in reinforced areas.
3. Tap lightly on balancer gear with a brass drift through the hole in the crankcase if necessary, to ensure the balancer shaft stays in the PTO side crankcase. Watch the gap along the crankcase mating surface and separate the crankcase evenly. It may also be necessary to tap the oil pump shaft lightly to separate the crankcase.

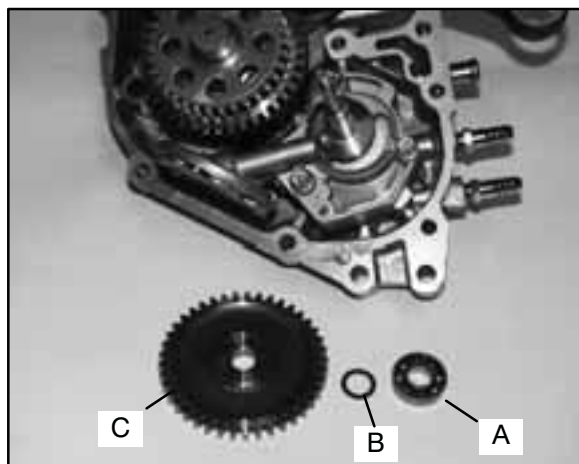
CAUTION: Do not strike the oil pump shaft at an angle or the shaft may bend, causing irreparable damage. Tap only *lightly* on the pump shaft if necessary.

4. Remove the Mag (RH) crankcase from the PTO case.

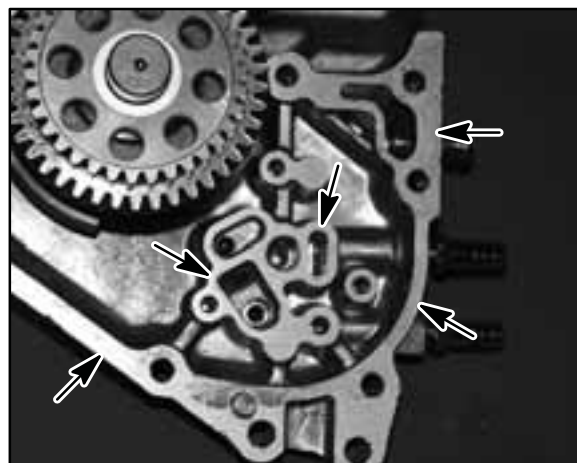


4. Remove three oil pump retaining bolts and pump.

OIL PUMP REMOVAL/INSPECTION



1. Remove pump shaft bearing (A) and thrust washer (B) from pump shaft.
2. Remove (2) bolts holding pump drive gear (C).
3. Inspect drive gear teeth for cracks, damage or excessive wear.

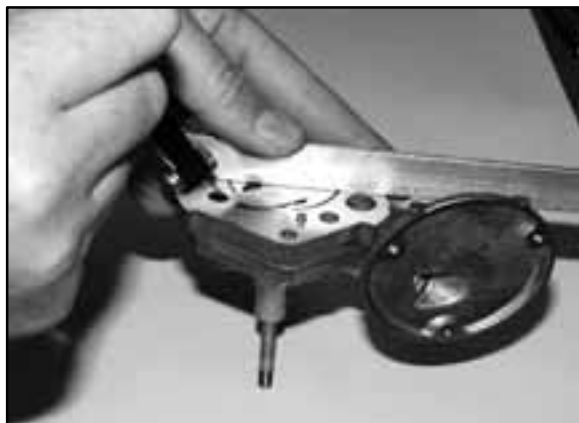


5. Inspect mating surface of crankcase and oil pump. Check for nicks, burrs, or surface irregularities.
6. Remove the three screws and strainer screen from pump.
7. Clean screen thoroughly.





8. Remove pump body screw and feed chamber cover.



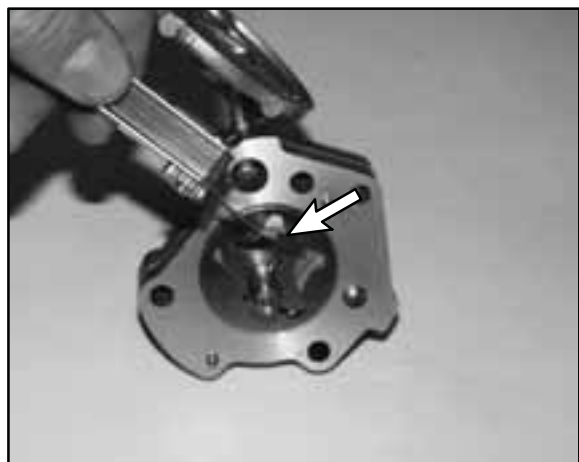
9. Measure pump end clearance using a feeler gauge and straight edge.

Pump End Clearance:

Std: .001-.003 (.0254-.0762 mm)

Wear Limit: .004 (.1016 mm)

10. Measure clearance between outer feed rotor and pump body with a feeler gauge.

**Rotor Tip Clearance:**

Std: .005 (.127 mm)

Wear Limit: .008 (.2032 mm)

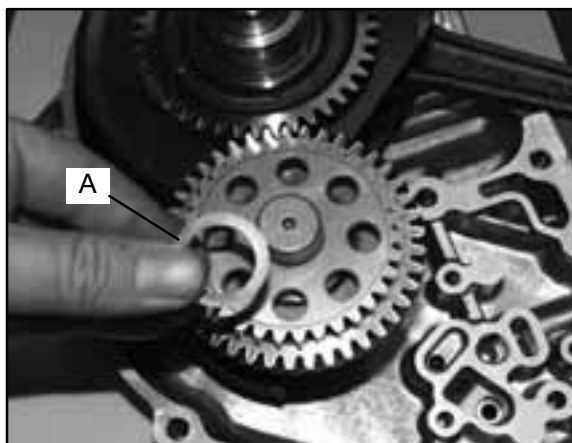
11. Measure rotor tip clearance with a feeler gauge.
12. Remove inner and outer feed rotor and pump chamber body.
13. Repeat measurements for scavenge rotor.
14. Remove inner and outer scavenge rotor and inspect pump shaft for wear.

OIL PUMP ASSEMBLY

1. Clean and dry all parts thoroughly. Apply clean engine oil to all parts. *Do not* use gasket sealer on the pump body mating surfaces or oil passages will become plugged.
2. Install pump shaft and scavenge rotor drive pin.
3. Install outer scavenge rotor, inner scavenge rotor, and scavenge casing.
4. Install outer feed rotor and inner feed rotor drive pin.
5. Install inner feed rotor and feed chamber cover with screw.
6. Tighten screw securely.
7. Install screen on pump body.
8. Install oil pump on crankcase and torque bolts to 6 ft. lbs. (8 Nm).

Oil Pump Attaching Bolt Torque:
6 ft. lbs. (8 Nm)

COUNTER BALANCERSHAFT REMOVAL/INSPECTION





1. Remove the shim washer (A) from the counter balancer shaft.



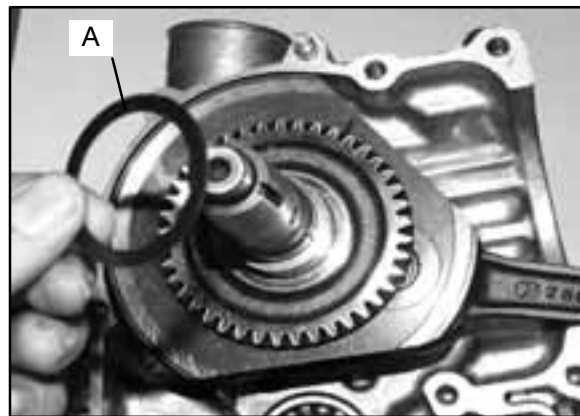
2. Note the alignment dots on the balancer and crankshaft gears, the marks must be aligned during reassembly.



3. Turn the shaft until balancer counter weights clear the crankshaft and remove the balancer shaft from the crankcase.
4. Inspect the balancer drive gear and pump shaft drive gear.
5. Replace the shaft if gear teeth are abnormally worn or damaged.
6. Inspect the balancer shaft bearings.

NOTE: Due to extremely close tolerances and minimal wear, the balancer shaft ball bearings must be inspected visually and by feel. Look for signs of discoloration, scoring or galling. Turn the inner race of each bearing. The bearings should turn smoothly and quietly. The outer race of each bearing should fit tightly in the crankcase. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

CRANKSHAFT REMOVAL/INSPECTION



1. Remove the shim washer (A) from the crankshaft.
2. Support the PTO side crankcase and crankshaft; press the crankshaft out. Be careful not to damage the crankcase mating surface or connecting rod.



3. Use a feeler gauge to measure the connecting rod big end side clearance.

Connecting Rod Big End Side Clearance:

Std: .0039-.0256" (.1-.65 mm)

Limit: .0315" (.80 mm)

4. Place the crankshaft in a truing stand or V-blocks and measure the runout on both ends with a dial indicator.

Max Runout: .0024" (.06 mm)

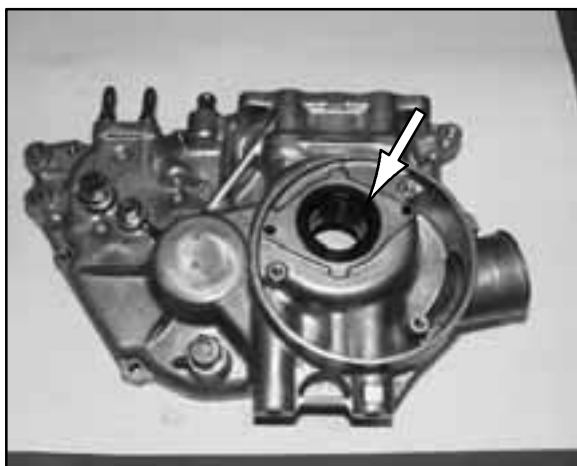


5. Measure the connecting rod big end radial clearance.

Big End Radial Clearance:**Std:** .0004-.0015" (.011-.038 mm)**Limit:** .0020" (.05 mm)

6. Inspect the crankshaft main bearing journals for scoring and abnormal wear.

CRANKCASE BEARING INSPECTION



1. Remove the seal from the PTO side crankcase.
2. Inspect the crankshaft main bearings, balancer shaft bearings, and pump shaft bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. Look for signs of discoloration, scoring or galling. Turn the inner race of each bearing. The bearings should turn smoothly and quietly. The outer race of each bearing should fit tightly in the crankcase. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

3. Support the crankcase and drive or press the main bearings out of each crankcase.
4. To remove balancer shaft bearings and pump shaft bearing use a blind hole bearing puller.

NOTE: Bearings are stressed during the removal process and *should not* be re-used!

PUMP SHAFT OIL SEAL/ WATER PUMP MECHANICAL SEAL REMOVAL (ENGINE DISASSEMBLED)

NOTE: The water pump mechanical seal can be removed without removing the engine. Refer to Water Pump Mechanical Seal Installation.

Replace the pump shaft seal and water pump mechanical seal whenever the crankcase is disassembled.



1. Remove the pump shaft bearing from the Magneto (right hand) side crankcase.
2. Pry out the oil seal, noting the direction of installation with the spring side facing IN (toward inside of case).
3. Drive the water pump mechanical seal out of the crankcase from inside to outside. Note: The new mechanical seal must be installed after the crankcases are assembled, using a special tool. See Mechanical Seal Installation.

CRANKCASE INSPECTION

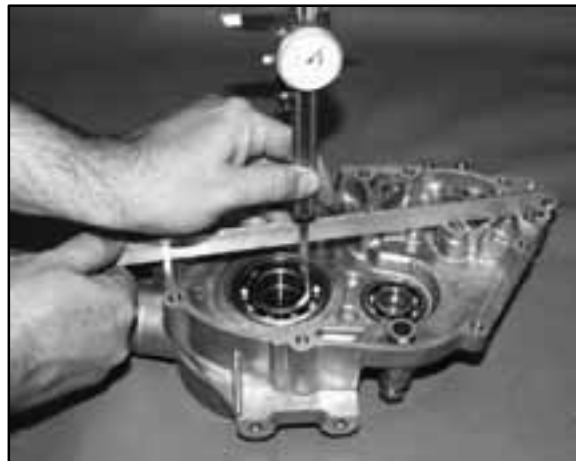
1. Remove all traces of gasket sealer from the crankcase mating surfaces. Inspect the surfaces closely for nicks, burrs or damage.
2. Check the oil pump and oil passage mating surfaces to be sure they are clean and not damaged.



BEARING INSTALLATION

NOTE: To ease bearing installation, warm the crankcase until hot to the touch. Place the bearings in a freezer.

1. Install the bearings so the numbers are visible.
2. Drive or press new bearings into the crankcases, using the proper driver. **CAUTION:** Press only on outer race of bearing to prevent bearing damage.
 - 70 mm (2.755") driver- For crankshaft main bearings.
 - 46 mm (1.810") For counter balancer bearings.
 - 28 mm (1.100") For pump shaft bearing.



END PLAY

INSPECTION/ADJUSTMENT

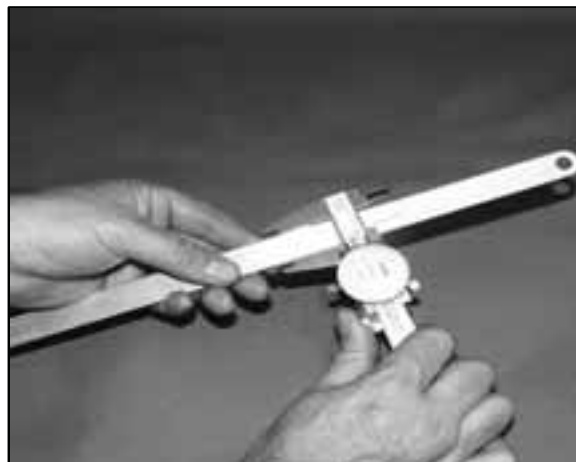
Before reassembling the crankcase, the following steps should be performed to determine the amount of crankshaft, counter balancer shaft, and pump shaft end play. Excessive end play may cause engine noise at idle and slow speeds. Too little play will side load the bearings which may lead to premature bearing failure.

CRANKSHAFT END PLAY ADJUSTMENT



1. Make sure all bearings are firmly seated in the both Mag and PTO crankcase.

2. Measure the distance from the PTO crankcase mating surface to the main bearing using a dial caliper and a straight edge.

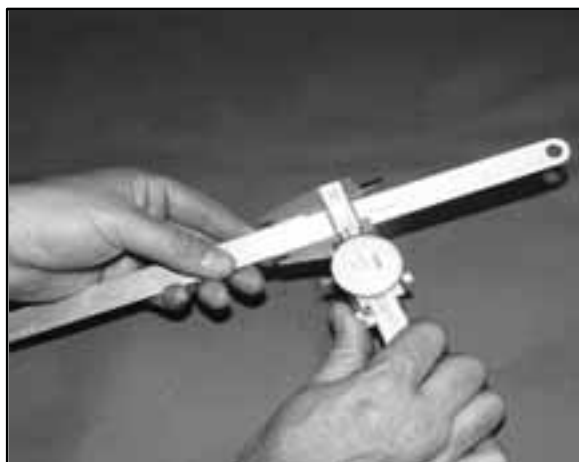


3. Subtract the thickness of the straightedge from the measurement obtained in Step 2 and record.

PTO Case Depth _____



4. Measure the distance from the Magneto crankcase mating surface to the main bearing using the same method and record.

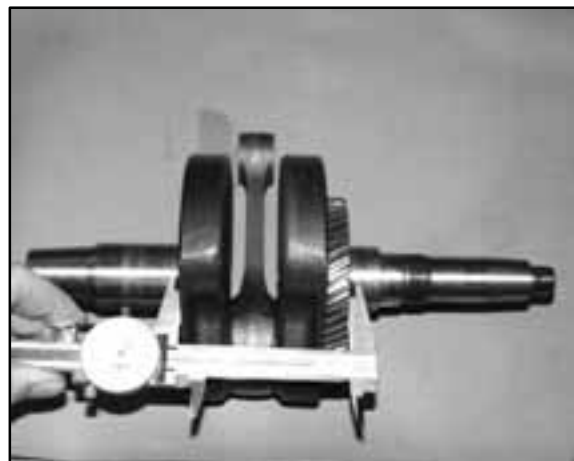


5. Subtract the thickness of the straightedge from the measurement obtained in Step 4 and record.

Mag Case Depth _____

6. Add the readings recorded in Step 3 and Step 5 and record below.

Total Case Width _____



7. Measure the width of the crankshaft at the bearing seats with a micrometer or dial caliper and record.

Crankshaft Width _____

8. Subtract the Crankshaft Width measured in Step 7 from the Total Case Width recorded in Step 6, and record below.

Total End Play _____

9. Subtract the thickness of the existing shim from the result of Step 8 to determine if a different shim is required. The result must be within the specified range listed at right.

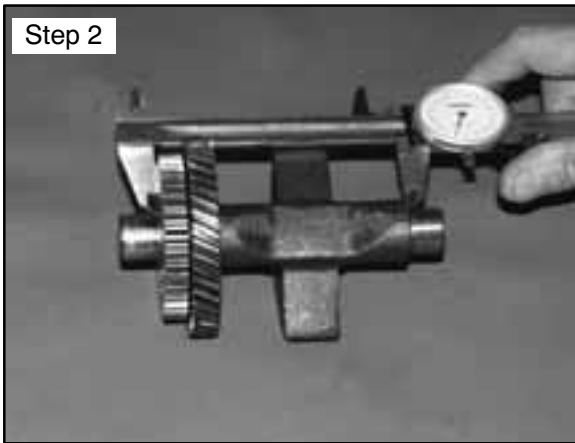
Crankshaft End Play:

.008"-.016" (.02-.04 cm)



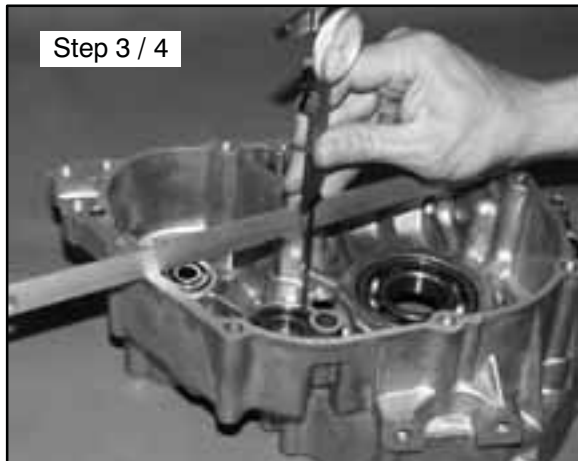
COUNTER BALANCER SHAFT END PLAY ADJUST.

Step 2



1. Make sure all bearings are firmly seated in the crankcase.
2. Measure the width of the counter balancer shaft at the bearing seats with a dial caliper or micrometer, and record reading.

Step 3 / 4



3. Measure the distance from the Mag crankcase mating surface to the balance shaft bearing using a dial caliper and a straight edge. Subtract the thickness of the straightedge and record.
4. Measure the distance from the PTO crankcase mating surface to the bearing using the same method outlined in Step 1, 2, and-3.
5. Add the readings obtained in Step 3 and Step 4.
6. Subtract the counter balancer shaft width measured in Step 2 from the figure obtained in Step 5.
7. Subtract the thickness of the existing shim from the result of Step 6 to determine if a different shim is needed. The result must be within the specified range listed at below.

Counter Balancer Shaft End Play:

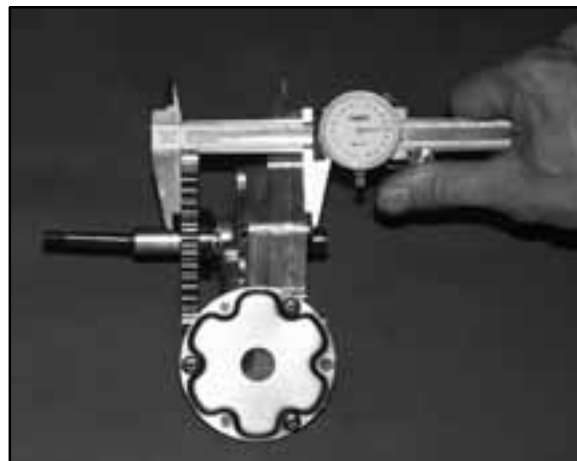
.008"-.016" (.02-.04 cm)

OIL PUMP SHAFT END PLAY ADJUSTMENT

1. Make sure the pump shaft bearing is firmly seated in the Magneto side crankcase.



2. Measure the distance from the magneto crankcase mating surface to the bearing using a dial caliper and a straight edge. Subtract the thickness of the straightedge and record.



3. Install the gear on the oil pump and measure the width of the pump and gear. Subtract this measurement from the measurement recorded in Step 2.
4. Subtract the thickness of the existing shim from the result of Step 3 to determine if a different shim is needed. See Shaft End Play Spec. next page.

**Pump Shaft End Play:****.008"-.016" (.02-.04 cm)**

PUMP SHAFT OIL SEAL INSTALLATION



1. Install the seal from the outside of the crankcase (water pump side) with the spring facing inward, toward the pump shaft bearing.
2. Drive or press the seal into place using a 25 mm (.985") seal driver, until flush with the outer edge of the seal bore.
3. Lubricate the seal lip with grease.

CRANKSHAFT/COUNTER BALANCE/OIL PUMP INSTALLATION

Lubricate all bearings with clean engine oil before assembly.

Use the Crankshaft/Water Pump Installation Kit (**PN 2871283**) to prevent damage to the crankshaft and main bearings during installation.

1. Install the crankshaft into the PTO side crankcase. Screw the threaded rod into the crankshaft until the threads are engaged a minimum of one inch (25.4mm).
2. Install the collar, washer, and nut onto the threaded rod. Hold the crankshaft and tighten the nut to draw the crankshaft into the main bearings until fully seated. Loosen the nut and remove the threaded rod from the crankshaft. If removal is

difficult, install two nuts on the end of the threaded rod and tighten against each other.

3. Install the proper shim on the magneto end of the crankshaft.
4. Place the balancer shaft in the PTO crankcase aligning the timing marks on the crankshaft and balancer gears. Install the proper shim washer on the shaft.
5. Inspect the oil pump sealing surface on the crankcase. Apply a light film of engine oil to the surface and install the oil pump.

NOTE: Do not use gasket sealer on the pump mating surfaces.

NOTE: After engine is assembled and machine is readied for field operation, oil pump **MUST** be primed. Follow oil pump priming procedure on Page 3.10.

Oil Pump Bolt Torque:**6. ft. lbs. (8 Nm)**

6. Align the drive gear with the drive pin on the pump shaft and install the gear. Be sure the gear is fully seated and properly engaged.
7. Install the proper shim washer on the pump shaft.

CRANKCASE ASSEMBLY

1. Apply Crankcase Sealant (**PN 2871557**) to the crankcase mating surfaces. Be sure the alignment pins are in place.
2. Set the crankcase in position carefully to avoid damaging the pump shaft seal, and install the magneto end crankshaft installation tool (follow instructions provided with the Crankshaft/Water Pump Installation Kit (**PN 2871283**)). Draw the crankcase halves together by tightening the nut on the tool and tapping lightly in the pump shaft area with a soft faced hammer to maintain alignment. Continually check alignment of the cases during installation, closing the gap equally until the surfaces are tightly seated.
3. Remove the tool.
4. Install the crankcase flange bolts and tighten in 3 steps following the pattern on Page 3.4 to specified torque.

Crankcase Bolt Torque:**14 ft. lbs. (19 Nm)**

**Crankcase Sealant:**

(PN 2871557)

WATER PUMP MECHANICAL SEAL INSTALLATION

1. Clean the seal cavity to remove all traces of old sealer.
2. Place a new mechanical seal in the seal drive collar, and install on the pump shaft.
3. Screw the guide onto the end of the pump shaft.
4. Install the washer and nut and tighten to draw seal into place until fully seated.
5. Remove the guide adaptor using the additional nut as a jam nut if necessary.

WATER PUMP MECHANICAL SEAL REMOVAL - ENGINE INSTALLED

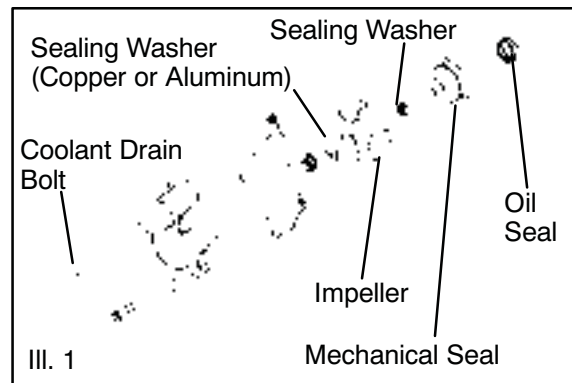
Water Pump Mechanical Seal Puller: (PN 2872105)

Replacement T-Handle: (PN 2872106)

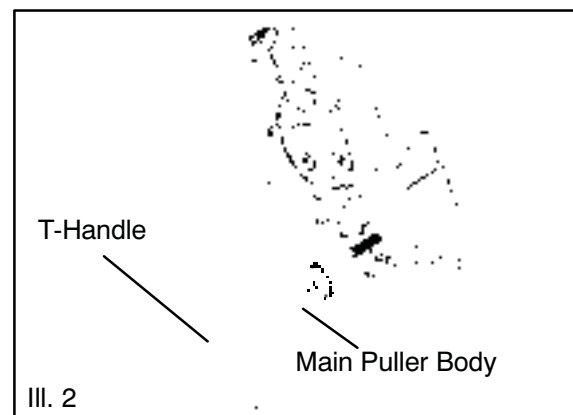
This tool allows a technician to replace the mechanical water pump seal on EH50PL engines without removing the engine and splitting the cases.

CAUTION:

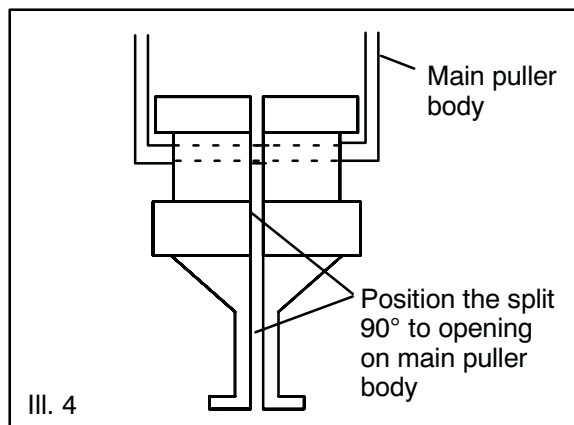
Improper or careless use of this tool or procedure can result in a bent water pump shaft. Pump shaft replacement requires engine removal and crankcase separation. Use caution while performing this procedure. Make sure that the puller is parallel to the shaft at all times. Do not place side loads on the water pump shaft or strike the puller or shaft in any way.



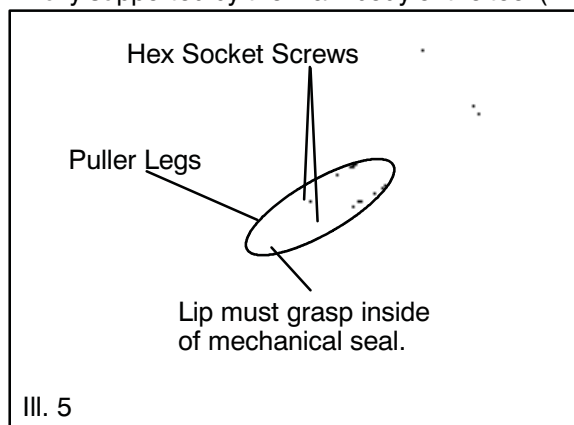
1. After the coolant has been drained, remove the water pump cover, impeller and the sealing washer. (III. 1)



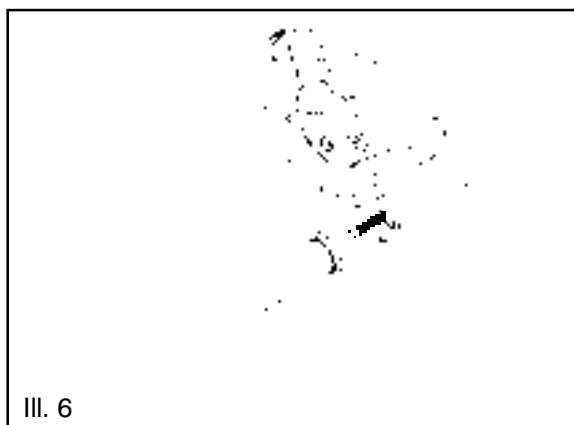
2. Slide the main puller body over the outer portion of the mechanical seal as shown in III. 2 and turn T-Handle clockwise until it contacts water pump shaft. Continue rotating until outer portion of mechanical seal is separated from the metal seal body.
3. Insert the puller legs between the water pump drive shaft and the remaining portion of the mechanical seal. Attach the puller legs to the main puller body. III. 3



4. Ensure that the split between the puller legs is fully supported by the main body of the tool (III 4).



5. Tighten the hex socket screws on the puller legs sufficiently so the lip of the puller legs will grasp the mechanical seal. III. 5



6. Turn the puller T-Handle clockwise until it contacts the water pump shaft. Continue rotating until the remaining portion of mechanical seal has been removed from the cases. III. 6 Pump shaft oil seal can also be replaced at this time if necessary.

7. The Water Pump Install Kit (PN 5131135) is required to install the new mechanical seal. This tool is available separately and it is also included in the Crankshaft/Water Pump Seal Installation Kit (PN 2871283).

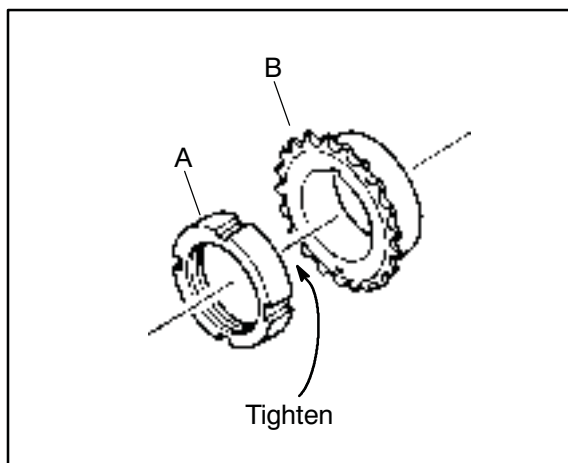
ONE WAY VALVE INSTALLATION

Install the one way valve plunger, spring, and plug using a new sealing washer.

One Way Valve Plug Torque:

16 ft. lbs. (22 Nm)

CAM CHAIN DRIVE SPROCKET INSTALLATION



1. Install the Woodruff key, drive sprocket, and slotted nut. Tighten the nut to the specified torque.

Slotted Nut Torque:

35-51 ft. lbs. (4.71-6.86 kg-m)



TENSIONER BLADE INSTALLATION

1. Install the tensioner blade and tighten the mounting bolt to specified torque.

Tensioner Blade Mounting Bolt Torque:

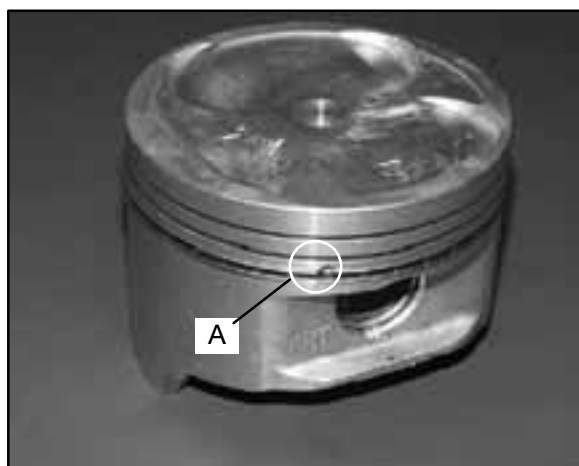
6 ft. lbs. (8 Nm)

PISTON RING INSTALLATION

NOTE: Apply clean engine oil to all ring surfaces and ring lands. Always check piston ring installed gap before rings are installed on piston. See Page 3.30. If the piston has been in service clean any accumulated carbon from the ring grooves and oil control ring holes.

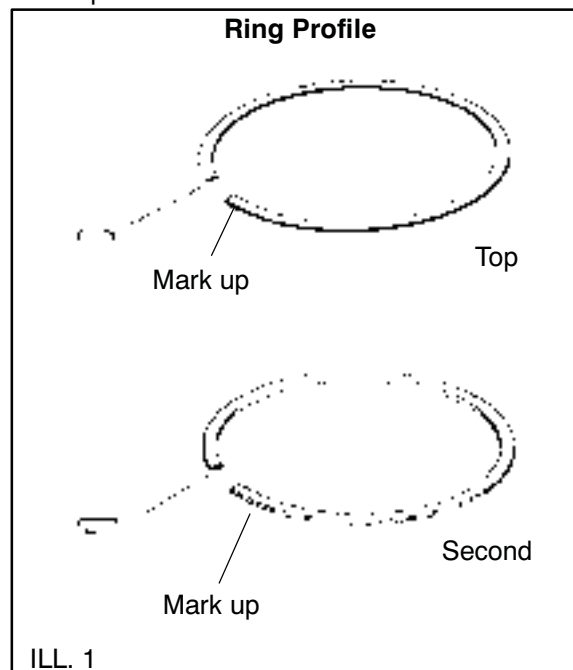
1. Place the oil control ring expander in oil ring groove with the end gap facing forward. The expander has no up or down marking and can be installed either way. The ends should butt squarely together and must not overlap.
2. Install the oil ring top rail.

NOTE: The top rail has a locating tab to prevent rotation. The tab must be positioned in the notch on the side of the piston as shown (A).



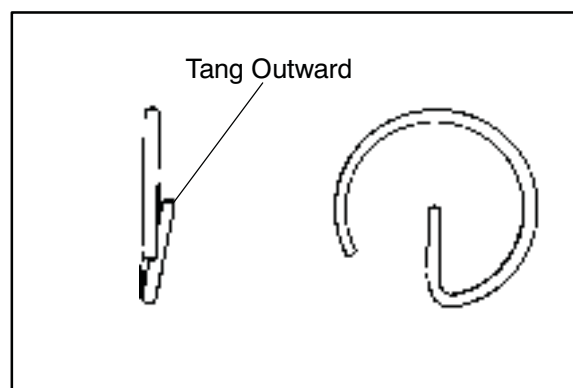
3. Install the bottom rail with the gap at least 30° from the end of the expander on the side opposite the top rail gap. (See ILL. 1).
4. Install the second ring with the "R" mark facing up. Position the end gap toward the rear (intake) side of the piston.

5. Install the top ring (chrome faced) with the "R" mark facing up and the end gap facing forward (toward the exhaust). (See ILL. 1).
6. Check to make sure the rings rotate freely in the groove when compressed.



PISTON INSTALLATION

1. Clean the gasket surfaces on the cylinder and crankcase. Remove all traces of old gasket material.
2. Make sure the cylinder mounting bolt holes are clean and free of debris.



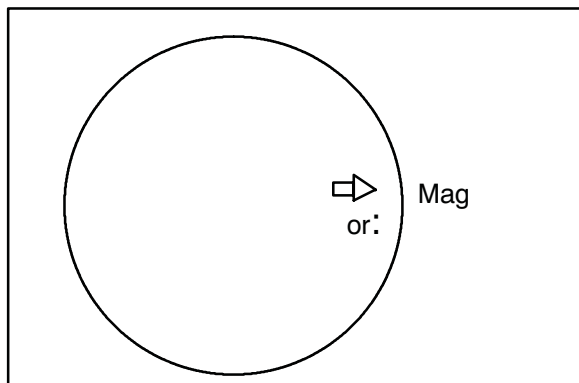
3. Install a new circlip on one side of the piston with the end gap facing *up* or *down*, and tang outward.

CAUTION: Circlips become deformed during the removal process. Do not re-use old circlips. Do not



compress the new clip more than necessary upon installation to prevent loss of radial tension. Severe engine damage may result if circlips are re-used or deformed during installation.

4. Apply clean engine oil to the piston rings, ring lands, piston pin bore, piston pin, and piston skirt. Lubricate the connecting rod (both ends), balancer drive gear, and crankshaft main bearing area.



5. Install the piston on the connecting rod with the arrow or : mark facing the magneto (RH) end of the crankshaft. The piston pin should be a push fit in the piston.
6. Install the other circlip with the gap facing up or down and tang outward. (See Caution with Step 3 above). Push the piston pin in both directions to make sure the clips are properly seated in the groove.

3. Apply clean engine oil to the ring compressor (Snap On™ PN RCL30) and install the compressor following manufacturers instructions. **CAUTION:** Make sure the oil control ring upper rail tab is positioned properly in the notch of the piston. Verify all ring end gaps are correctly located.

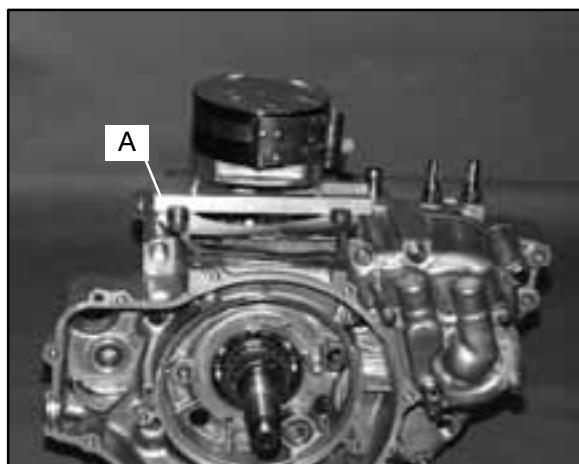


4. Apply clean engine oil liberally to the cylinder bore and tapered area of the sleeve. Install the cylinder with a slight rocking motion until the rings are captive in the sleeve.



CYLINDER INSTALLATION

1. Place the dowel pins in the crankcase and install a new cylinder base gasket.



2. Position the Piston Support Block (PN 2870390) (A) beneath the piston skirt to support the piston during cylinder installation.

5. Remove the ring compressor and support block.
6. Push the cylinder downward until fully seated on the base gasket.
7. Apply a light film of oil to the threads and flange surface of the cylinder mounting bolts.
8. Install all four bolts finger tight. Rotate the engine and position the piston at BDC.

NOTE: If cam chain is installed, hold it up while rotating the engine to avoid damage to the chain, drive sprocket teeth, or tensioner blade.



9. Tighten the cylinder bolts in three steps in a criss cross pattern and torque to specifications.
10. Install the two 6 mm bolts.

Cylinder Bolt Torque:

10mm - 46 ft. lbs. (62 Nm)
6mm - 6 ft. lbs. (8 Nm)

CYLINDER HEAD INSTALLATION

Clean the gasket surfaces on the cylinder head and cylinder. Remove all traces of old gasket material. Refer to disassembly photos.

1. Install the cam chain tensioner guide. Be sure bottom end of guide is located properly in crankcase.
2. Install the two dowel pins and a new cylinder head gasket.
3. Place the cylinder head on the cylinder. Apply a film of engine oil to the cylinder head bolt threads and washers, and hand tighten the bolts.

The following procedure must be used to torque the cylinder head properly:

Torque all bolts evenly in a criss cross pattern

***Torque bolts to 22 ft. lbs. (30 Nm)**

***Torque bolts to 51 ft. lbs. (70 Nm)**

***Loosen bolts evenly 180° (1/2 turn)**

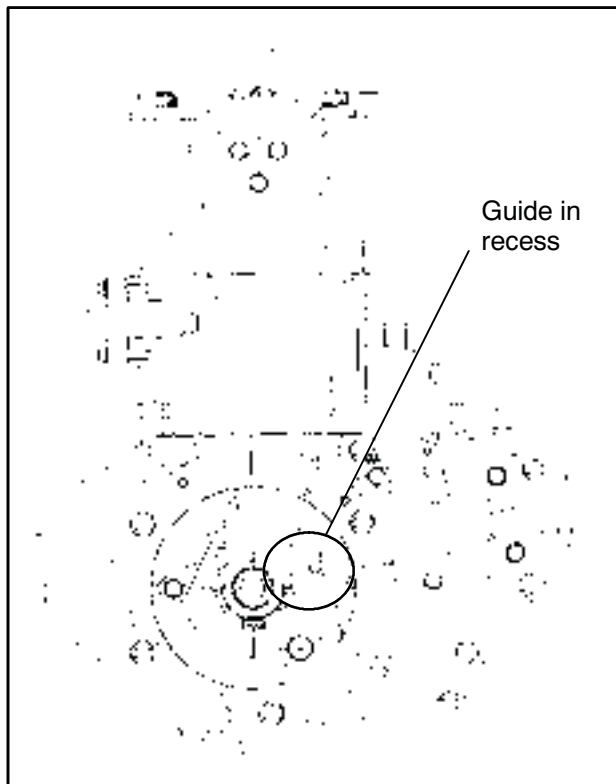
***Loosen bolts again another 180° (1/2 turn)**

***Torque bolts to 11 ft. lbs. (15 Nm)**

***From this point, tighten bolts evenly 90° (1/4 turn)**

***Finally, tighten another 90° (1/4 turn)**

***Install two 6mm bolts and torque to 6 ft. lbs. (8 Nm)**



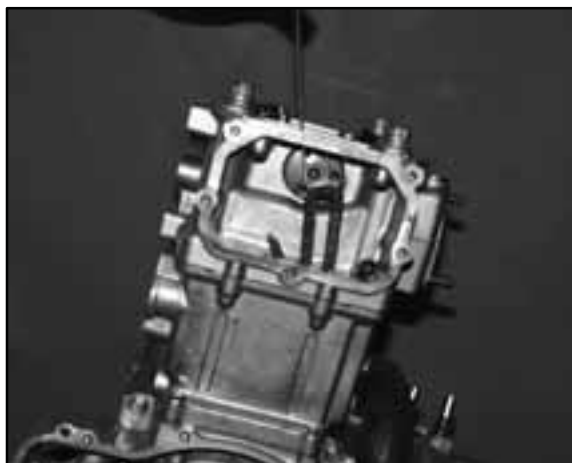
CAM CHAIN/CAMSHAFT INSTALLATION

Install the cam chain over the crankshaft.

CAUTION: Serious engine damage may result if the camshaft is not properly timed to the crankshaft.

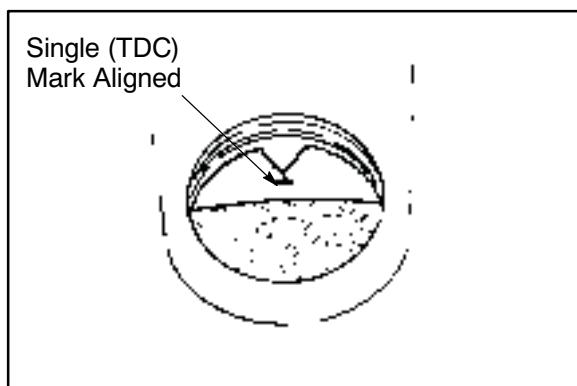
IMPORTANT CAMSHAFT TIMING NOTE: In order to time the camshaft to the crankshaft, the piston must be precisely located at Top Dead Center (TDC).

CAMSHAFT TIMING

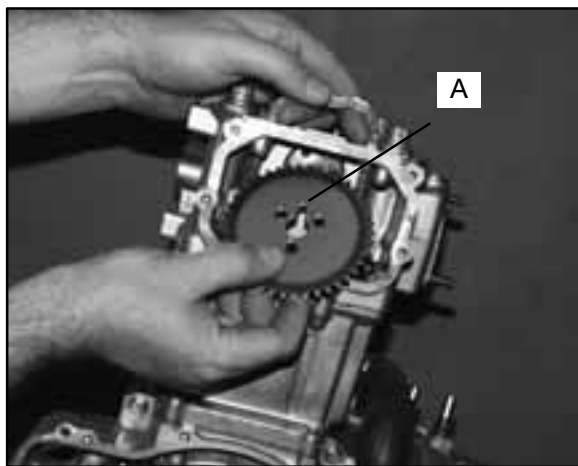




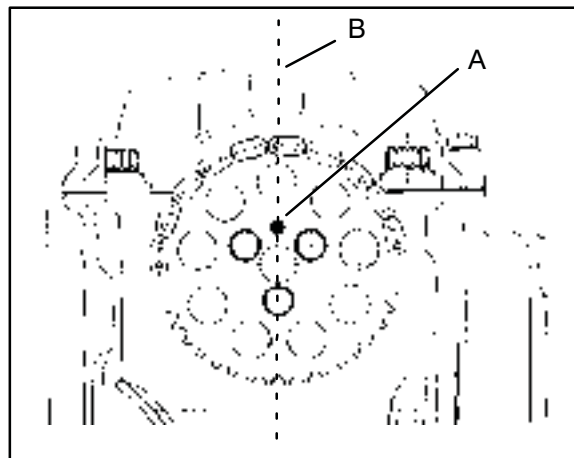
1. Apply Polaris Premium Starter Drive Grease (**PN 2871460**) to the camshaft main journals and cam lobes. Lubricate automatic compression release mechanism with clean engine oil. (To install the compression release mechanism, refer to Page 3.21).
2. Install the camshaft with the lobes facing downward and the sprocket alignment pin facing upward.



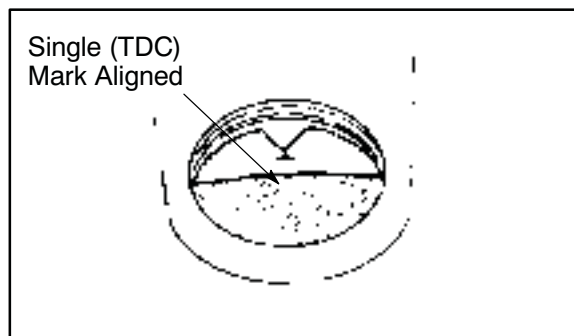
3. Disconnect the wire from the cam chain and rotate the engine to align the single (TDC) timing mark (Top Dead Center) on the flywheel with the notch in the timing inspection window. Be sure to use the *single* TDC mark when installing the cam. Do not use the advance marks. See Ill. on next page.



4. Loop the cam chain on the cam sprocket with the dots on the sprocket facing outward and the alignment pin notch facing directly upward.



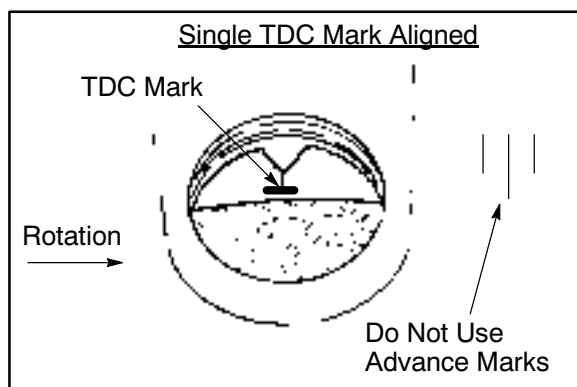
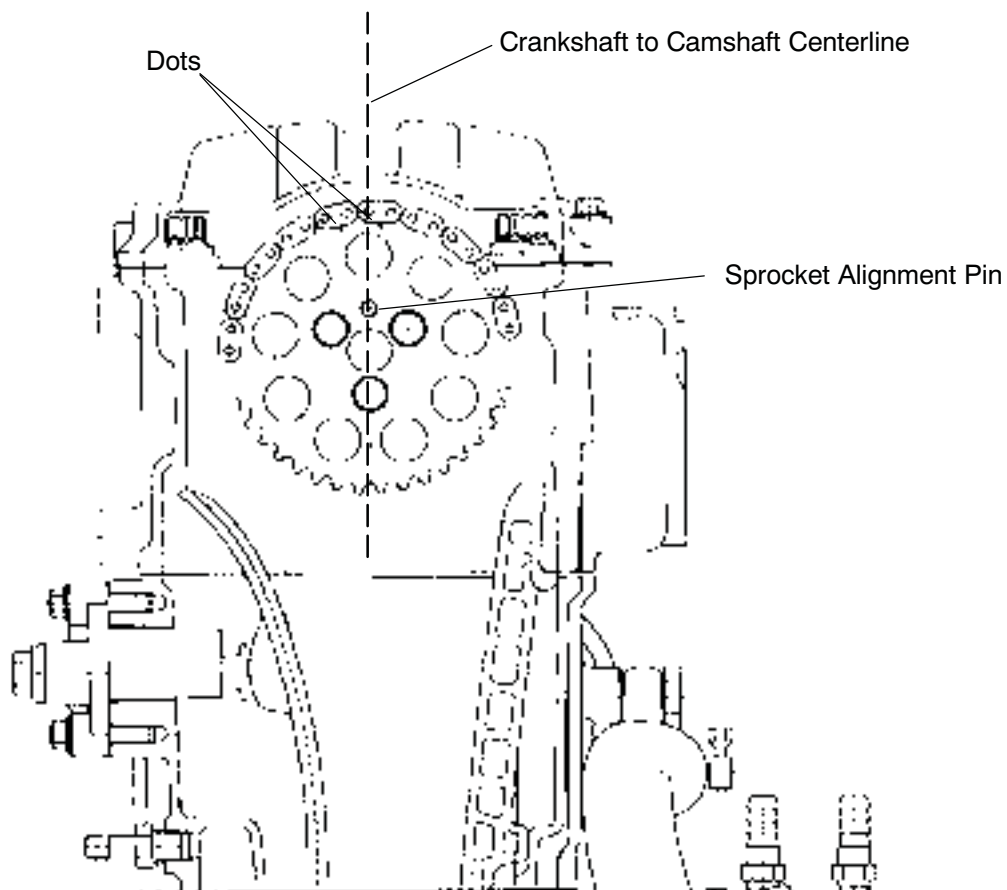
5. Before positioning the sprocket on the camshaft, check the position of the cam sprocket alignment pin. When the cam is positioned properly, the cam sprocket alignment pin (A) is directly in line with the crankshaft/camshaft centerline (B).
6. Install the sprocket on the camshaft. Apply Loctite™ 242 (**PN 2871949**) to the cam sprocket bolts and torque to specifications.

Cam Sprocket Bolt Torque:**6 ft. lbs. (8 Nm)**

7. Verify TDC mark in timing inspection hole and alignment pin is directly in line with crankshaft to camshaft centerline. Refer to Ill. on following page.
8. Apply Crankcase Sealant (**PN 2871557**) to the camshaft end cap and install using a new O-Ring.
9. Check all cam timing marks to verify proper cam timing, and install the cam chain tensioner body with a new gasket.
10. After tensioner installation, rotate engine at least two revolutions and re-check marks/timing.

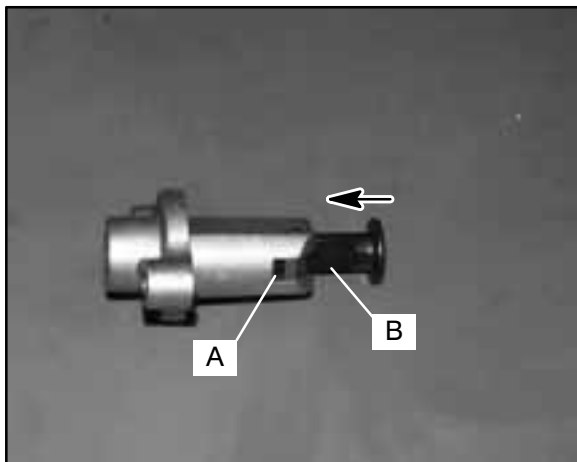


CAMSHAFT TIMING





CAM CHAIN TENSIONER INSTALLATION



1. Release the ratchet pawl (A) and push the tensioner plunger (B) all the way into the tensioner body.
2. Install the tensioner body with a new gasket and tighten the bolts.

Tensioner Bolt Torque:

6 ft. lbs. (8 Nm)

3. Install the spring, new sealing washer, and tensioner plug.

Tensioner Plug Torque:

17 ft. lbs. (23 Nm)

4. Slowly rotate engine two to three revolutions and re-check cam timing.

STATOR, FLYWHEEL AND STARTER DRIVE INSTALLATION

NOTE: The stator, flywheel, starter drive, and recoil can be assembled with the engine in the frame.

Stator

1. Apply a light film of grease to the crankshaft seal. Apply molybdenum disulfide grease or assembly lubricant to the crankshaft bushing.
2. Install a new O-Ring in the oil passage recess in the crankcase.
3. Apply Crankcase Sealant (**PN 2871557**) or an equivalent sealer to the stator plate outer surface and install a new O-Ring.



4. Install the stator plate being careful not to damage the seal. Align timing reference marks on the plate and crankcase. Be sure the plate is fully seated.
NOTE: This is a static timing mark. Strobe timing should be performed after start up.
5. Torque bolts evenly to specification.

Stator Plate Bolt Torque:

5-6.5 ft. lbs. (7-9 Nm)

6. Seal stator wire grommet with Crankcase Sealant (**PN 2871557**) or equivalent sealer.

Flywheel

1. Install flywheel, washer, and nut. Torque flywheel to specification.

Flywheel Nut Torque:

58-72 ft. lbs. (78-98 Nm)

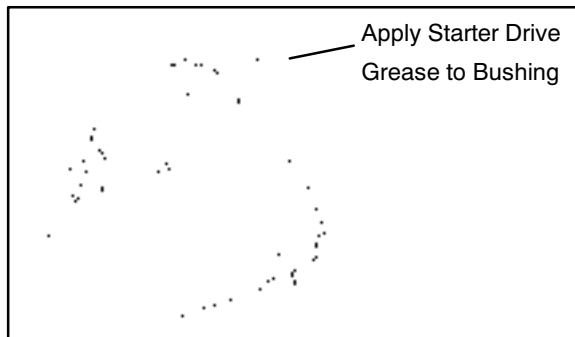


Starter

Drive



1. Be sure the washer is positioned on the back of the drive gear.



2. Apply starter drive grease to the drive bushing in the crankcase and all moving surfaces of the starter drive mechanism. Install the starter drive.
3. Install recoil housing gasket and recoil housing.

Starter Drive Grease:

(PN 2871460)

ROCKER SHAFT/ROCKER ARM ASSEMBLY INSTALLATION

1. Assemble rocker arms, rocker shaft, and shaft supports.
2. Install and tighten rocker arm shaft locating bolt.
3. Apply starter drive grease to the cam lobes and cam follower surfaces.
4. Rotate the engine until the cam lobes are pointing downward.

5. Be sure the dowel pins are in place and install the rocker shaft assembly.
6. Apply a light film of engine oil to the threads of the bolts and tighten evenly.

Rocker Shaft Support Tower Bolt Torque:

9 ft. lbs. (12 Nm)

Rocker Shaft Locating Bolt Torque:

6 ft. lbs. (8 Nm)

7. Adjust valves according to the valve adjustment procedure found in Chapter 2, Maintenance.
8. Apply clean engine oil liberally to the valve springs, cam chain, rocker arms, and camshaft.
9. Place a new rocker cover gasket on the cylinder head and install the cover and bolts.

Rocker Cover Bolt Torque:

6 ft. lbs. (8 Nm)

THERMOSTAT INSTALLATION



Install the thermostat with one of the air bleed holes positioned next to the upper thermostat cover bolt hole as shown.



OIL PIPES

Install the oil pipes with new sealing washers. Tighten all bolts evenly to specified torque.

Oil Pipe Bolt Torque:

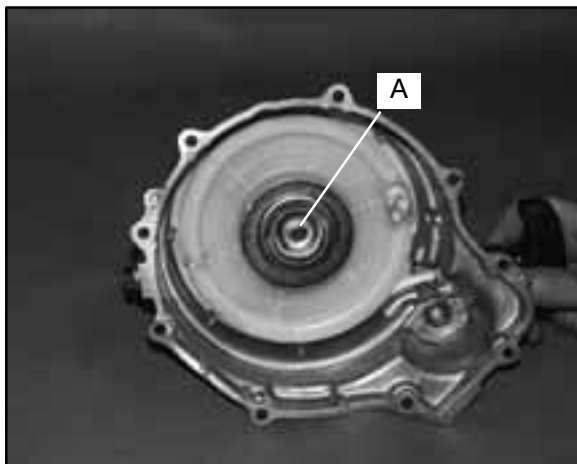
20 ft. lbs. (27 Nm)

RECOIL DISASSEMBLY/INSPECTION

CAUTION: The recoil is under spring tension. A face shield and eye protection is required during this procedure.

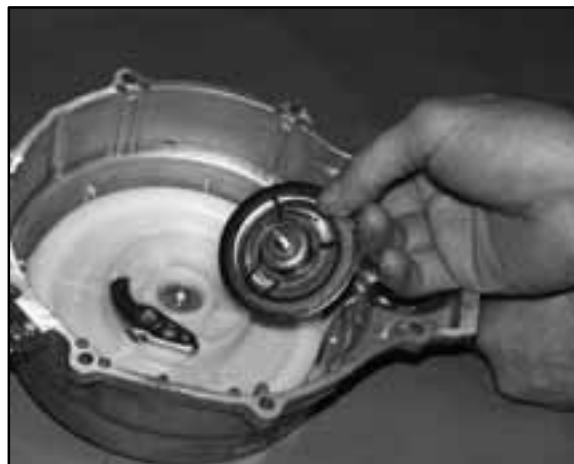
Replace any parts found to be worn or damaged.

REMOVE BOLTS AND RECOIL HOUSING



10. Pull recoil rope so it is extended approximately 12-18". Check handle c-ring for proper tension, and the handle for cracks or damage which may allow water or dirt to enter the recoil housing through the rope. **NOTE:** The handle must seal tightly on the recoil housing to prevent water from entering.

11. Remove center bolt from recoil friction plate (A).



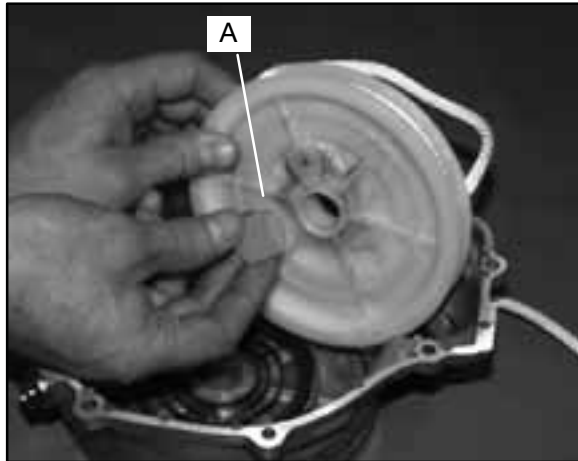
12. Inspect plate for wear or damage. Inspect plate friction spring for wear, damage, and proper tension. The spring should fit tightly on friction plate.



13. Remove ratchet pawl with spring and inspect. Replace spring or ratchet pawl if worn, broken, or damaged.

NOTE: Long arm of spring engages reel. Short end against pawl.

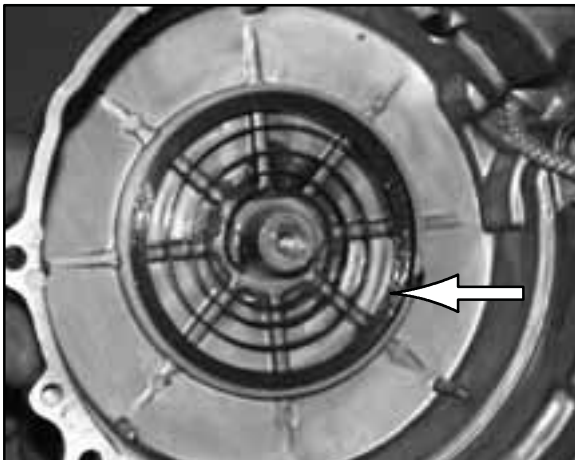
14. Hold reel firmly in housing. Pull rope handle until 12-18" of rope is exposed, and hold reel in place.
15. Place rope in notch on outer edge of reel. Release tension on hub and allow reel to unwind approximately 6-7 turns until spring tension is released.



16. Slowly and carefully remove reel from recoil housing making sure the spring remains in the housing. Inspect the reel hub and bushing (A) for wear.
17. Unwind rope and inspect for cuts or abrasions.
18. Inspect drive tab on hub return spring for damage. To remove hub return spring, hold outer coils in place with one hand and slowly remove spring one coil at a time from the inside out.
19. Pull knot out of of recoil reel. Untie knot. Remove rope from reel.

RECOIL ASSEMBLY

CAUTION: Be sure to wear a face shield and eye protection when performing this procedure.



To install a new spring:

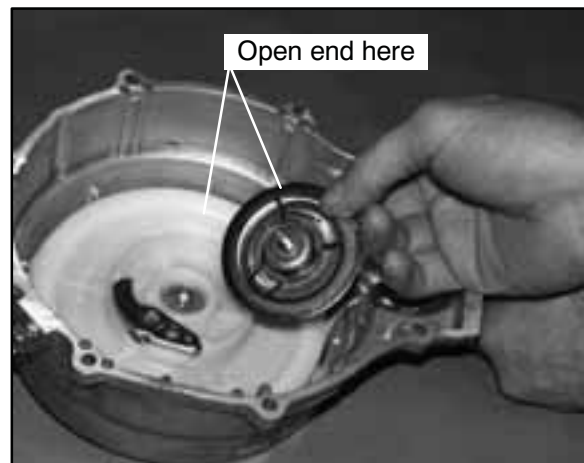
1. Place spring in housing with the end positioned so the spring spirals inward in a counterclockwise direction. See photo at right.
2. Hold spring in place and cut retaining wire.

To reinstall an old spring:

1. Hook outer tab in place in recoil housing and wind spring in a counterclockwise direction one coil at a time while holding the installed coils in place.
2. Lubricate the spring with light lubricant such as Premium All Season Grease (PN 2871423).

To complete recoil assembly:

1. Route rope through guide bushing in recoil housing and into reel. Tie a secure knot in end of the rope.
2. Wind rope counterclockwise onto the reel, as viewed from ratchet side of reel.
3. Lock rope into notch on outer edge of reel.
4. Apply a small amount of grease or equivalent to the center post of the housing and the bushing.



5. Install reel into housing making sure the spring drive tab on the reel engages the spring and the reel is fully seated in the housing.
6. Apply downward pressure on the reel and rotate counterclockwise approximately 6-7 turns to pre-wind the spring. Continue rotating counterclockwise until rope on outer edge aligns with rope guide bushing.
7. Release rope from notch and allow reel to rewind completely. If more pre-wind is required, place rope in notch and add additional turns of pre-wind.
8. Install ratchet pawl and return spring, with long leg of spring engaged in reel.
9. Reinstall friction plate. **NOTE:** The friction plate must be positioned with both end tabs of the friction spring opposite the ratchet pawl.
10. Torque friction plate retaining bolt to 5-6 ft. lbs. (7-9 Nm).
11. Reinstall recoil housing using a new gasket. Seal stator wire harness grommet with RTV silicone.



SPARK PLUG FOULING

- Spark plug cap loose or faulty
- Choke cable adjustment or plunger/cable sticking
- Foreign material on choke plunger seat or plunger
- Incorrect spark plug heat range or gap
- Carburetor inlet needle and seat worn
- Jet needle and/or needle jet worn or improperly adjusted
- Excessive carburetor vibration (loose or missing needle jet locating pins)
- Loose jets in carburetor or calibration incorrect for altitude/temperature
- Incorrect float level setting
- PVT system calibrated incorrectly or components worn or mis-adjusted
- Fuel quality poor (old) or octane too high
- Low compression
- Restricted exhaust
- Weak ignition (loose coil ground, faulty coil, stator, or ETC switch)
- ETC switch mis-adjusted
- Restricted air filter (main or pre-cleaner) or breather system
- Improperly assembled air intake system
- Restricted engine breather system
- Oil contaminated with fuel
- Restricted oil tank vent

TROUBLESHOOTING

Engine Turns Over But Fails to Start

- No fuel
- Dirt in fuel line or filter
- Fuel will not pass through fuel valve
- Fuel pump inoperative/restricted
- Tank vent plugged
- Carb starter circuit
- Engine flooded
- Low compression (high cylinder leakage)
- No spark (Spark plug fouled)

Engine Does Not Turn Over

- Dead battery
- Starter motor does not turn
- Engine seized, rusted, or mechanical failure

Engine Runs But Will Not Idle

- Restricted carburetor pilot system
- Carburetor misadjusted
- Choke not adjusted properly
- Low compression
- Crankcase breather restricted

Engine Idles But Will Not Rev Up

- Spark plug fouled/weak spark
- Broken throttle cable
- Obstruction in air intake
- Air box removed (reinstall all intake components)
- Incorrect or restricted carburetor jetting
- ETC switch limiting speed
- Reverse speed limiter limiting speed
- Carburetor vacuum slide sticking/diaphragm damaged
- Incorrect ignition timing
- Restricted exhaust system

Engine Has Low Power

- Spark plug fouled
- Cylinder, piston, ring, or valve wear or damage (check compression)
- PVT not operating properly
- Restricted exhaust muffler
- Carburetor vacuum slide sticking/diaphragm damaged
- Dirty carburetor

Piston Failure - Scoring

- Lack of lubrication
- Dirt entering engine through cracks in air filter or ducts
- Engine oil dirty or contaminated

Excessive Smoke and Carbon Buildup

- Excessive piston-to-cylinder clearance
- Wet sumping
- Worn rings, piston, or cylinder
- Worn valve guides or seals
- Restricted breather
- Air filter dirty or contaminated

Low Compression

- Decompressor stuck



- Cylinder head gasket leak
- No valve clearance or incorrectly adjusted
- Cylinder or piston worn
- Piston rings worn, leaking, broken, or sticking
- Bent valve or stuck valve
- Valve spring broken or weak
- Valve not seating properly (bent or carbon accumulated on sealing surface)
- Rocker arm sticking

Backfiring

- ETC or speed limiter system malfunction
- Fouled spark plug or incorrect plug or plug gap
- Carburetion faulty - lean condition
- Exhaust system air leaks
- Ignition system faulty:
 - Spark plug cap cracked/broken
 - Ignition coil faulty
 - Ignition or kill switch circuit faulty
 - Ignition timing incorrect
 - Sheared flywheel key
- Poor connections in ignition system
- System wiring wet
- Valve sticking
- Air leaks in intake
- Lean condition

- Ignition timing misadjusted
- Low oil level
- Spark plug incorrect heat range
- Faulty hot light circuit
- Thermostat stuck closed or not opening completely

Temperature Too Low

- Thermostat stuck open

Leak at Water Pump Weep Hole

- Faulty water pump mechanical seal (coolant leak)
- Faulty pump shaft oil seal (oil leak)

COOLING SYSTEM TROUBLESHOOTING

Overheating

- Low coolant level
- Air in cooling system
- Wrong type of coolant
- Faulty pressure cap or system leaks
- Restricted system (mud or debris in radiator fins or restriction to air flow, passages blocked in radiator, lines, pump, or water jacket)
- Lean mixture (restricted jets, vents, fuel pump or fuel valve)
- Fuel pump output weak
- Restricted radiator (internally or cooling fins)
- Water pump failure
- Cooling system restriction
- Cooling fan inoperative or turning too slowly (perform current draw test)



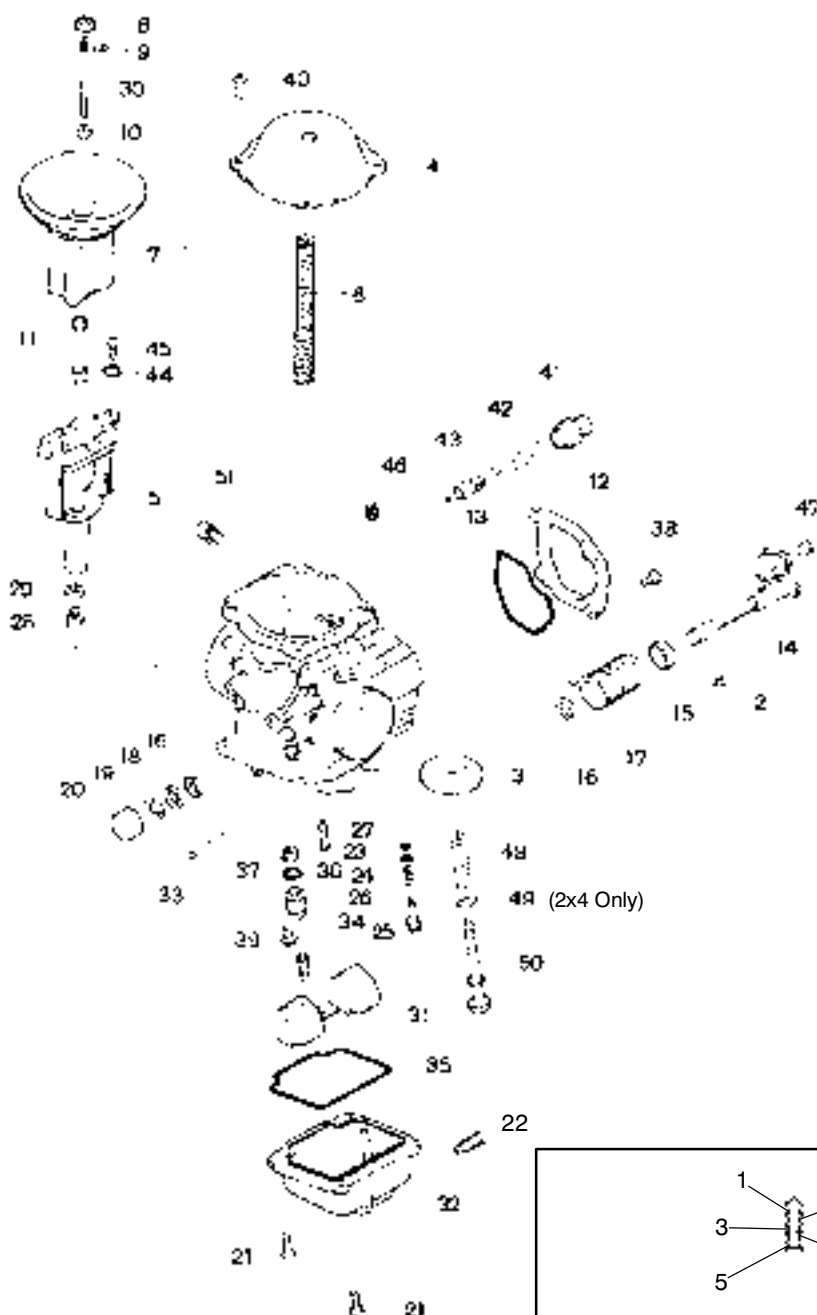
CHAPTER 4

FUEL SYSTEM/CARBURETION

Exploded View, Mikuni BST 34 Carburetor . . .	4.2
Fuel Tank Asm. Exploded View	4.3
Fuel Flow Diagram	4.3
Special Tool & Jetting Guidelines	4.4
Carburetor Jetting	4.4
Main Jet / Pilot Jet Part Numbers	4.4
CV Carburetor System Function (4 Cycle) . . .	4.5
CV Carburetor Vent System (4 Cycle)	4.5
CV Carburetor Operation	4.5-4.7
Removal, CV Carburetor	4.8
Disassembly Notes, CV Carburetor	4.8-4.9
Cleaning, CV Carburetor	4.9
Inspection, CV Carburetor	4.10
Assembly, CV Carburetor	4.10
Float Adjustment, CV Carburetor	4.11
Needle & Seat Leakage Test	4.11
Fuel Level	4.12
Fuel Pump Service	4.12
Fuel Tank Removal / Installation	4.12-4.13
Troubleshooting	4.13-4.14

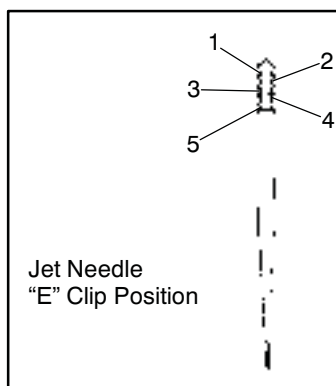


BST 34 CARBURETOR EXPLODED VIEW



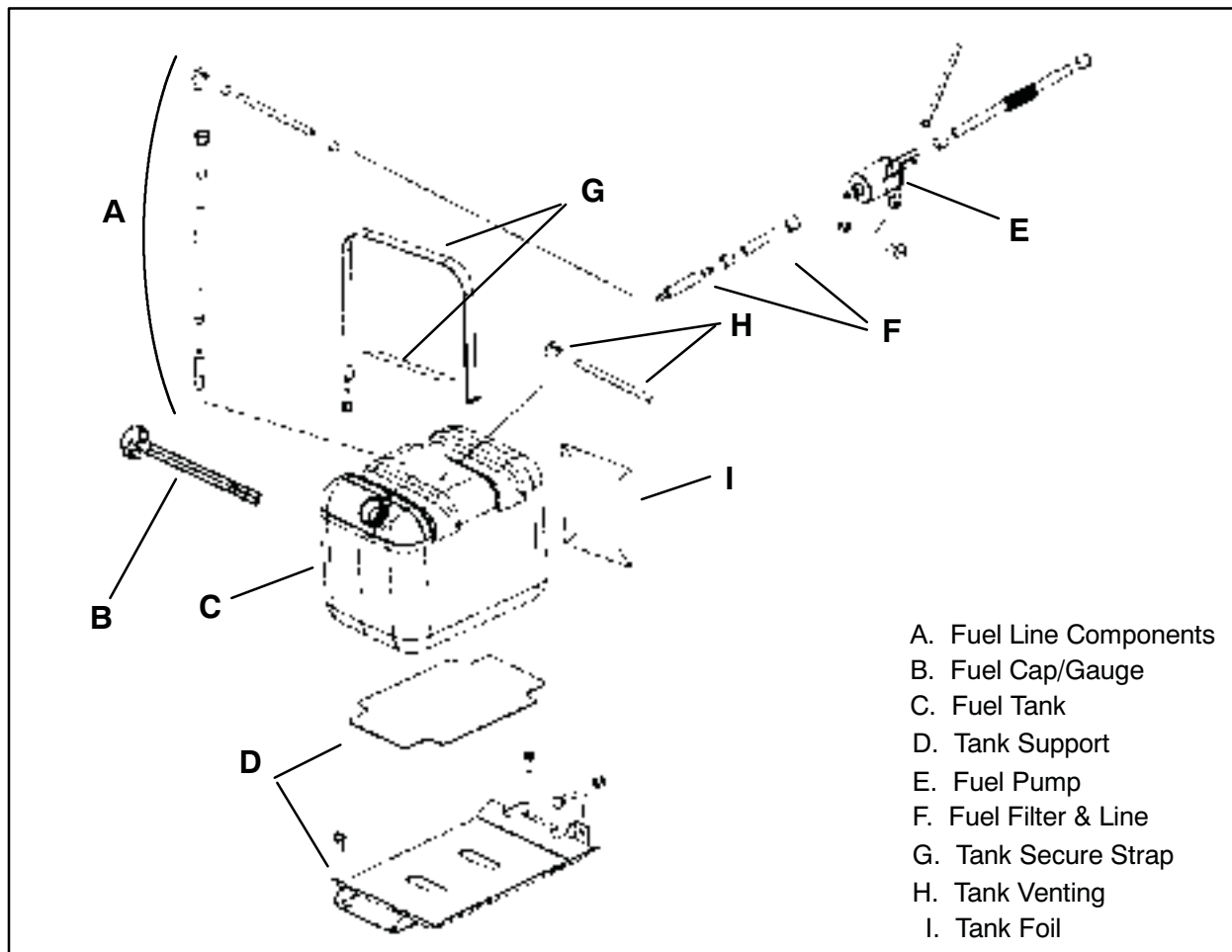
1. Carburetor Assembly
2. Screw
3. Throttle Valve
4. Cover, Diaphragm
5. Jet Block Assembly
6. Spring
7. Diaphragm Assembly
8. Ring
9. "E" Ring
10. Ring
11. Needle Jet
12. Cover
13. O-Ring
14. Throttle Shaft Assembly
15. Ring
16. Seal
17. Spring
18. Packing
19. "E" Ring
20. Cap
21. Screw
22. Drain Screw
23. O-Ring
24. Washer
25. Adjuster
26. Spring
27. Pilot Jet
28. Main Jet
29. Washer
30. Jet Needle
31. Float Assembly
32. Float Body Assembly
33. Float Pin
34. Needle Valve
35. O-Ring
36. O-Ring
37. Filter
38. Screw
39. Screw
40. Screw
41. Guide Holder
42. Spring
43. Plunger Assembly
44. Spring Washer
45. Screw
46. Air Jet
47. Cable Guide
48. Spring
49. Ring
50. Adjust Screw
51. Screw and Washer Assy.

Refer to Page 4.4 for Jet Part Numbers

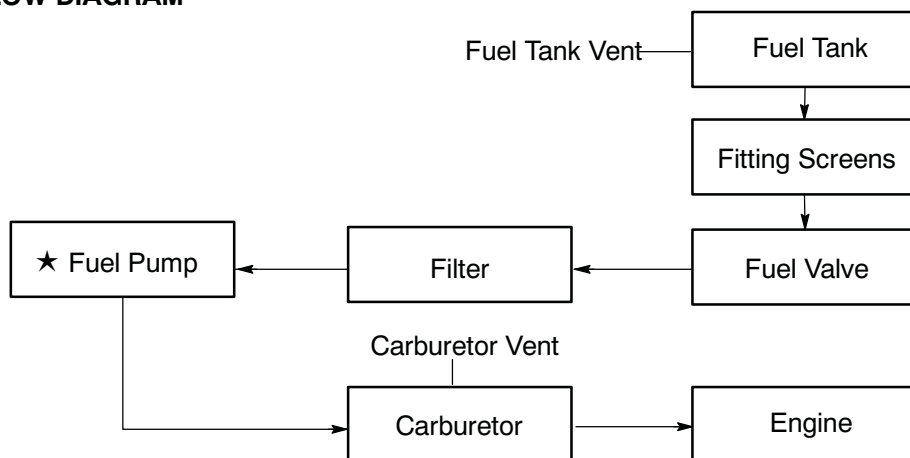




FUEL TANK ASSEMBLY



FUEL FLOW DIAGRAM



★ Located Above Oil Tank



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool
2872314	Carburetor Float Adjustment Tool

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

- ⚠ Always stop the engine and refuel outdoors or in a well ventilated area.
- ⚠ Do not overfill the tank. The tank is at full capacity when the fuel reaches the bottom of the filler neck. Leave room for expansion of fuel.
- ⚠ Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- ⚠ Never drain the float bowl when the engine is hot. Severe burns may result.
- ⚠ Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- ⚠ If you get gasoline in your eyes or if you should swallow gasoline, seek medical attention immediately.
- ⚠ If you spill gasoline on your skin or clothing, immediately wash with soap and water and change clothing.

JETTING GUIDELINES

Changes in altitude and temperature affect air density, which is essentially the amount of oxygen available for combustion. In low elevations and cold temperatures, the air is more dense and has more oxygen. In higher elevations and higher temperatures, the air is less dense with reduced oxygen.

Polaris ATV Carburetors are calibrated for an altitude of 0-6000 ft. (0-1800 meters) and ambient temperatures between +40 and +80° F (+5° to +26° C). Carburetors must be re-calibrated if operated

outside this temperature and/or altitude range. The jetting installed in production is not intended for all altitudes and/or temperatures. In addition, air screw / pilot screw adjustments and PVT adjustments may be required to suit operating conditions.

CARBURETOR JETTING

CAUTION:

A main jet that is too small will cause a lean operating condition resulting in serious engine damage. Select the correct main jet carefully for elevation and temperature according to the specifications or in the Owner's Safety and Maintenance Manual for each particular model.

IMPORTANT: The following guidelines must be followed when establishing a main jet setting:

1. Select the lowest anticipated temperature at which the machine will be operated.
2. Determine the lowest approximate altitude at which the machine will be operated.
3. Select the correct main jet from the chart on page 1.4.
4. Clutching changes may also be required for changes in elevation. Refer to clutching chart on page 1.4 for recommendations.

MIKUNI JET PART NUMBERS

Main Jets		Pilot Jets	
Jet Number	Part Number	Jet Number	Part Number
112.5	3130554	40.0	3130624
115	3130555	42.5	3130526
117.5	3130556		
120	3130557		
122.5	3130558		
125	3130559		
127.5	3130560		
130	3130561		
132.5	3130562		
135	3130563		
137.5	3130564		
140	3130527		
142.5	3130566		
145	3130567		
147.5	3130568		
150	3130569		
152.5	3130570		
155	3130571		
157.5	3130572		
160	3131141		
162.5	3131142		
165	3131143		
167.5	3131144		
170	3131145		



CV CARBURETOR SYSTEM FUNCTION

Carburetor Component Function			
System	Main Components	Main Function	Main Affect
Float System (Level Control)	Inlet Pipe, Needle and Seat, Float, Float Pin	Maintains specified fuel level in float chamber (carburetor float bowl)	All systems All throttle ranges
Venting	Passages in Carburetor, Vent lines to frame	Supplies atmospheric pressure to float chamber	All systems All throttle ranges
Starter (Choke/Enrichment)	Choke Lever, Cable, Plunger, Return Spring, Carb Passages (Starter Jet, Starter Bleed Pipe)	Supplies additional fuel air mixture necessary for cold starting	All throttle ranges Greatest effect at low throttle settings and idle
Pilot (Idle System)	Pilot Jet/Passage-ways, Pilot-Mixture Screw with Spring Washer and Sealing O-Ring, Bypass Ports (Behind Throttle Plate), Pilot Air Jet, Pilot Outlet, Throttle Plate	Primarily supplies fuel at idle and low throttle positions	Mainly idle to 1/4 throttle Minimal effect after 1/2 throttle
Main System	Main Jet, Main Air Jet, Main Air Passage, Needle Jet, Jet Needle, Vacuum Slide, Throttle Plate	Supplies fuel at mid-range and high throttle settings.	1/4 to full throttle

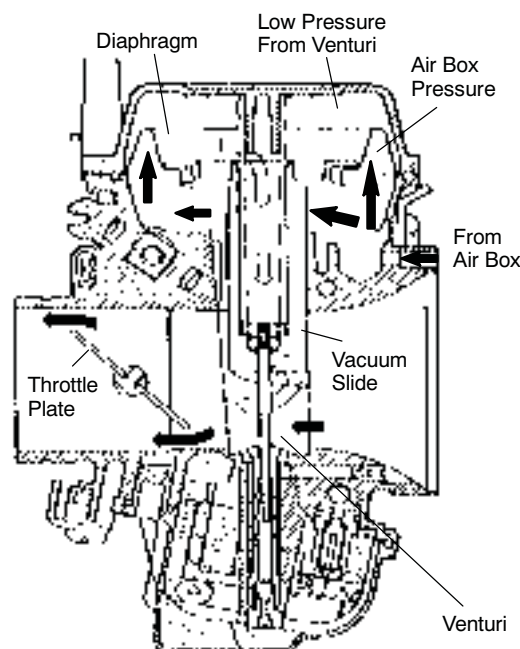
VENT SYSTEMS - CV CARBURETOR

The carburetor float bowl vent lines supply atmospheric pressure to the float bowl. The lines must be free of kinks, restrictions and be properly routed. This allows fuel to flow in the proper amount and prevents contaminants from entering the carburetor.

MIKUNI CV CARB OPERATION

The constant velocity carburetor incorporates a mechanically operated throttle plate and a vacuum controlled slide valve (vacuum slide). The venturi cross-sectional area in the carburetor bore is increased or decreased automatically by the vacuum slide, which moves according to the amount of negative pressure (less than atmospheric) present in the venturi.

A diaphragm attached to the top of the vacuum slide is sealed to the slide and to the carburetor body forming two chambers. The chamber above the diaphragm is connected to the venturi area by a drilled orifice in the center of the vacuum slide. The chamber below the diaphragm is vented to atmospheric pressure by a passage on the air box side of the carburetor. A spring, installed in the center of the vacuum slide, dampens the slide movement and assists the return of the slide.

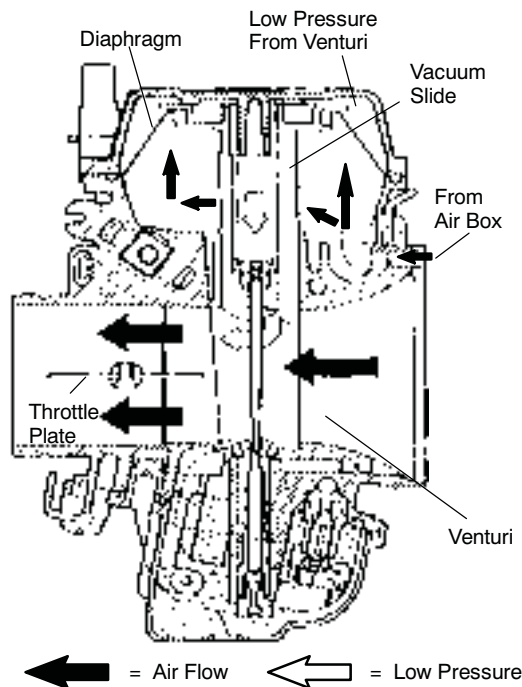


← = Air Flow ← = Low Pressure



CARBURETOR OPERATION CONT'D

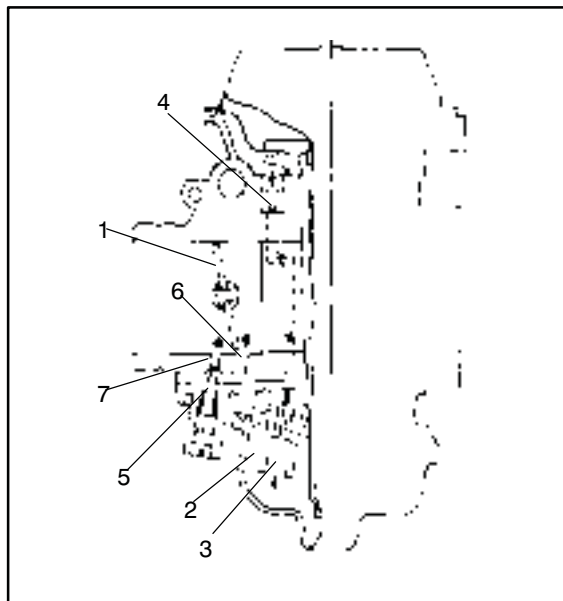
When the throttle plate is opened and engine speed begins to increase, the pressure in the venturi (and therefore in the chamber above the diaphragm) becomes significantly lower than atmospheric. Atmospheric pressure in the chamber below the diaphragm forces the diaphragm upward, raising the slide against spring pressure. When the pressure above and below the diaphragm are nearly equal, the slide moves downward under spring pressure. Raising or lowering the slide increases or decreases the cross sectional area in the venturi, and therefore the air velocity in the venturi is kept relatively constant. This provides improved fuel atomization and optimum fuel/air ratio.



Note: Diagrams are for explanation of theory only, and are not true representations of Mikuni BST carburetor.

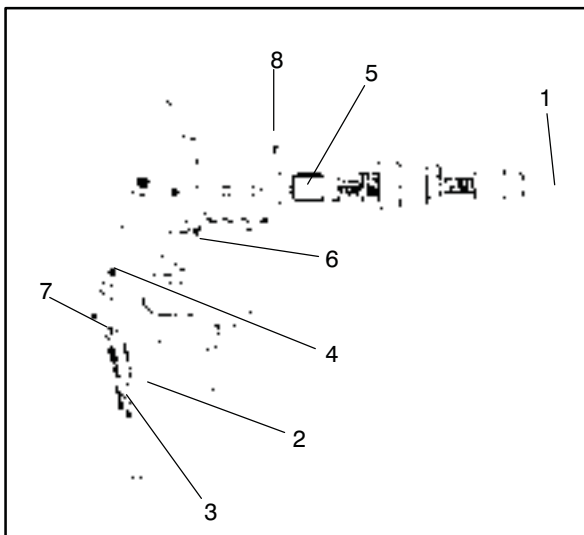
PILOT (IDLE AND SLOW) SYSTEM

This system supplies fuel during engine operation with throttle valve closed (1) or slightly opened. The fuel from float chamber (2) is metered by pilot jet (3) where it mixes with air coming in through pilot air jet (4). The mixture then goes up through pilot passage to pilot screw (5). A part of the mixture is discharged into the main bore out of bypass ports (6). The remainder is then metered by pilot screw and discharged into the main bore through pilot outlet (7).



STARTER SYSTEM (CHOKE OR ENRICHMENT)

When the choke cable (1) is activated, the starter plunger (5) is lifted off the seat.

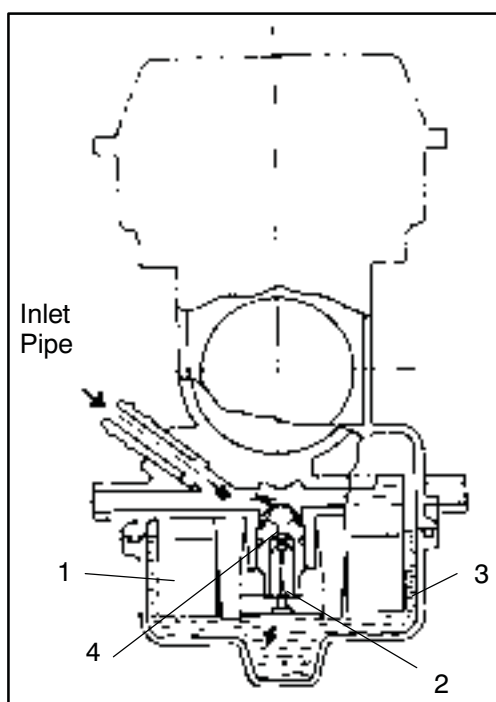


Fuel is drawn into the starter circuit from the float chamber (2) through the starter jet (3). Starter jet meters this fuel, which then flows into starter pipe (4) and mixes with the air (7) coming from the float chamber. The mixture, rich in fuel content, reaches starter plunger and mixes again with the air coming through a passage (8) extending from underneath the diaphragm. The rich fuel/air mixture for starting is discharged through starter outlet (6) in the the main bore.



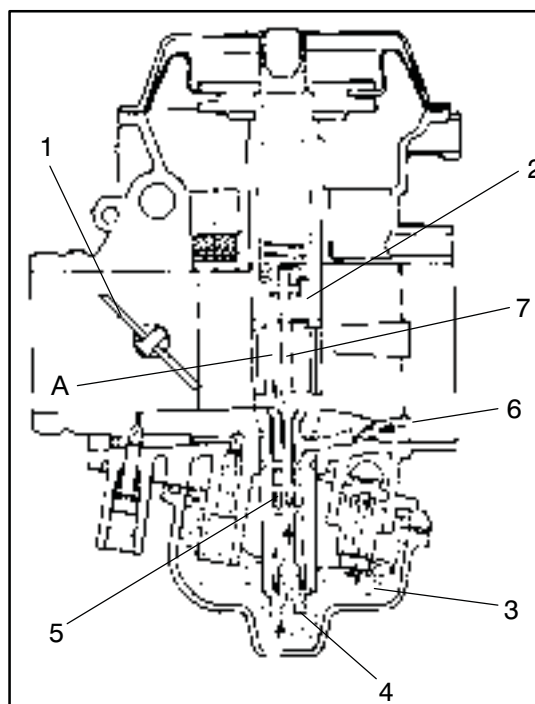
FLOAT SYSTEM

Fuel enters the float chamber (3) by means of the inlet pipe and passage, through a screen on the back of the inlet needle seat (4), and around the inlet needle (2). As the fuel fills the float chamber, the float (1) rises and forces the inlet needle against the seat, shutting off the orifice in the seat. When fuel level is up in float chamber, floats are up and needle valve remains pushed up against valve seat. Under this condition, no fuel enters the float chamber. As the fuel level falls, floats go down and needle valve unseats itself to admit fuel into the chamber. In this manner, the needle valve admits and shuts off fuel alternately to maintain a practically constant fuel level inside the float chamber.



MAIN SYSTEM

As throttle valve (1) is opened, engine speed rises, and this increases negative pressure in the venturi. Consequently the vacuum slide (2) moves upward. The fuel in float chamber (3) is metered by main jet (4), and the metered fuel enters needle jet (5), in which it mixes with the air admitted through main air jet (6) to form an emulsion. The emulsified fuel then passes through the clearance between needle jet (5) and jet needle (7), and is discharged into the venturi (A). Mixture proportioning is accomplished in needle jet (5); the clearance through which the emulsified fuel must flow is determined ultimately by throttle position and vacuum slide height.



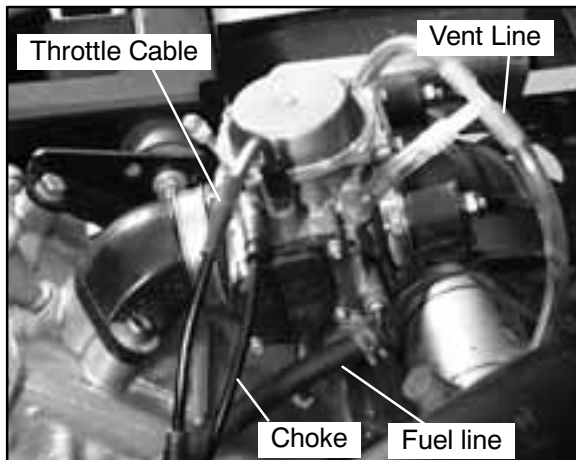


CARBURETOR REMOVAL

1. Remove the seat.



2. Disconnect:
 - Vent lines
 - Drain line
 - Fuel line
 - Throttle cable
 - Choke cable



NOTE: Drain and dispose of fuel properly

3. Loosen air box carb boot clamp.
4. Loosen carburetor flange clamp at front of carburetor.
5. Remove the carburetor mounting screws from the carburetor bracket.
6. Remove carburetor. Place a shop towel in carb flange to prevent dirt from entering.

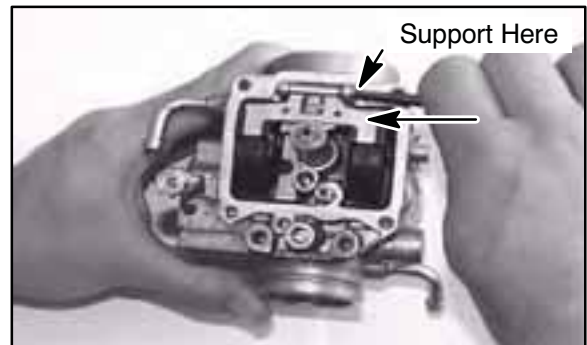


CARBURETOR DISASSEMBLY - MIKUNI CV

NOTE: Series 11 *RANGER* 2x4, 4x4, and 6x6 will have tamper resistant screws on Diaphragm Cover per 2003 CARB standards for LSI (large spark ignition) engines. All *RANGER*'s are classified within LSI. The existence of these tamper resistant screws will require customers to purchase a complete carburetor if they desire to replace jet needle or piston slide.

A main jet change is the only requirement for altitude adjustment of the carburetor. These tamper resistant screws will not prevent anyone from adjusting the main jet size of carburetor when operating at high altitude.

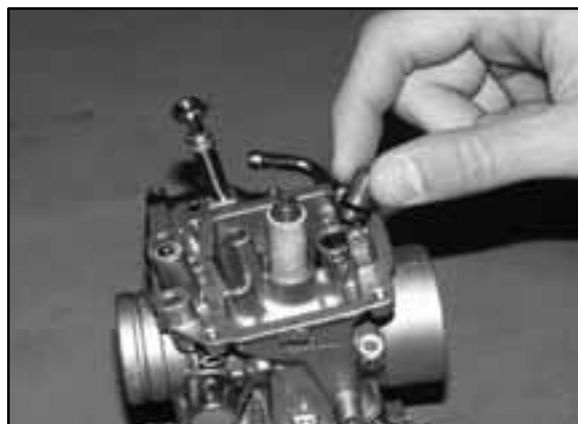
1. Remove float bowl and carefully remove the pressed float pin.



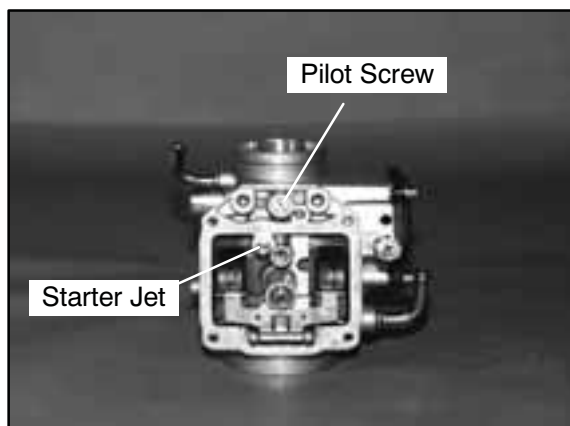
NOTE: Be careful not to damage the float pin tower during the float pin removal. Support the float pin tower while removing the float pin. This helps to prevent the float pin towers from breaking off.



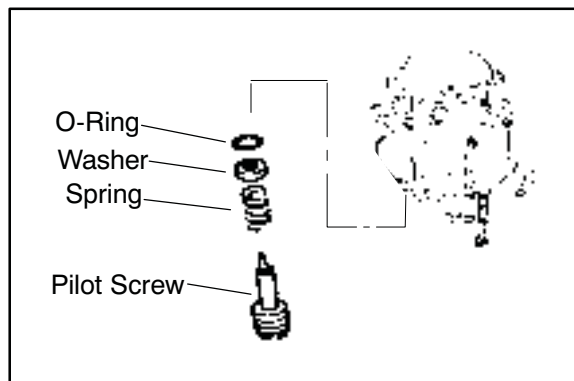
2. Remove inlet needle seat retaining screw along with plate, and carefully remove needle seat.
NOTE: Do not use a pliers to remove the seat or permanent damage may occur.



NOTE: The starter jet is not removeable. Upon disassembly, place the parts in a container for safe keeping.



3. Remove the pilot mixture screw, spring, flat washer, and O-Ring. If an anti-tamper plug is installed over the pilot screw cavity, it must be removed for access.



CARBURETOR CLEANING

⚠ WARNING

Protect eyes from contact with cleaner. Take appropriate safety measures during these procedures. Safety glasses and chemical resistant gloves are required. Should you get cleaner in your eyes or if you swallow cleaner, seek medical attention immediately.

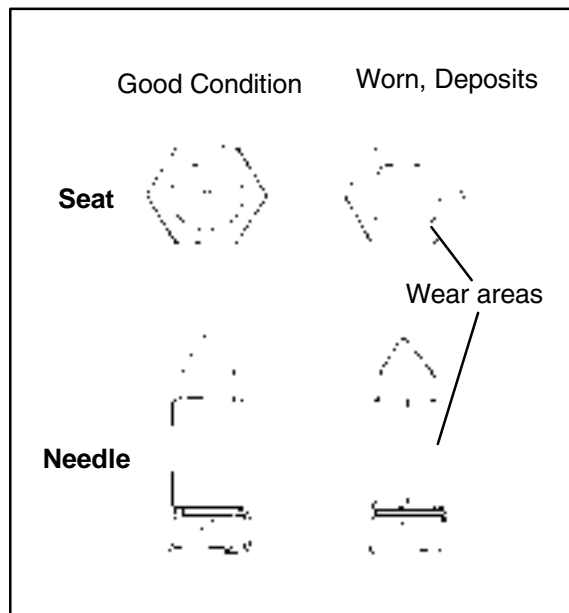
Carburetor cleaners can be extremely caustic. Extended periods of soaking can loosen the adhesive sealer on the passage drill-way plugs. *Do not* soak rubber or plastic components (such as the vacuum slide diaphragm, needle seat screen, or O-Rings in caustic cleaning solutions. Irreparable damage may occur. Do not use agitator-type carburetor cleaning equipment. Rubber parts must be cleaned with mild detergent and hot water only.

1. Thoroughly clean the carburetor body, jets, and all passages with carburetor cleaner or electrical contact cleaner.
2. If the carburetor is extremely dirty or contaminated with fuel residue and varnish, soak for short periods only in carburetor cleaner, and rinse in hot water.
3. Replace the jets if they have a buildup of fuel residue or bacterial growth that cannot be removed. Even a small amount of residue will reduce the flow characteristics of the jet.
4. Verify all passages and jets are unobstructed by spraying electrical contact cleaner through the passages. **CAUTION:** Do not use wire or welding tip cleaners as the orifice size may be altered.
5. Use low pressure air to dry carburetor body and all components.



CARBURETOR INSPECTION

1. Inspect the inlet needle tapered surface for any sign of wear or damage. Be sure the spring loaded pin is free moving and returns freely when pushed. The inlet needle and seat should be pressure tested after assembly.

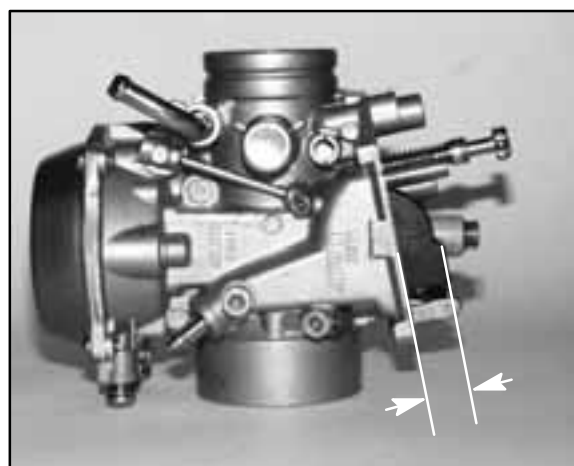


**Pilot Mixture Screw Base Setting
(Set at Factory)**

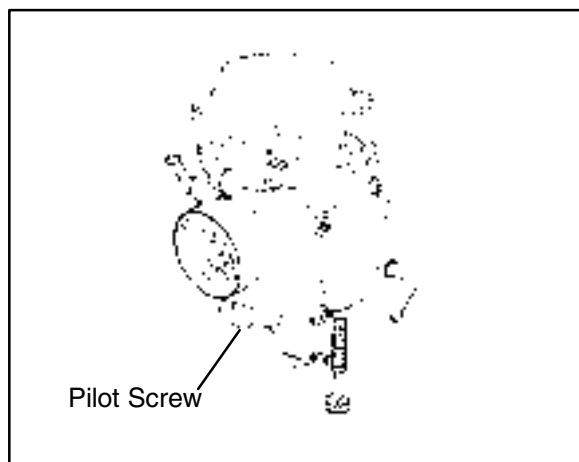
Refer to Specifications in Chapter 1

FLOAT HEIGHT ADJUSTMENT

1. Place the carburetor on a level surface as shown at right to remove weight from float arm. In this position, the float tongue will rest lightly on the inlet needle valve pin without compressing the spring.



CARBURETOR ASSEMBLY



Float Height:

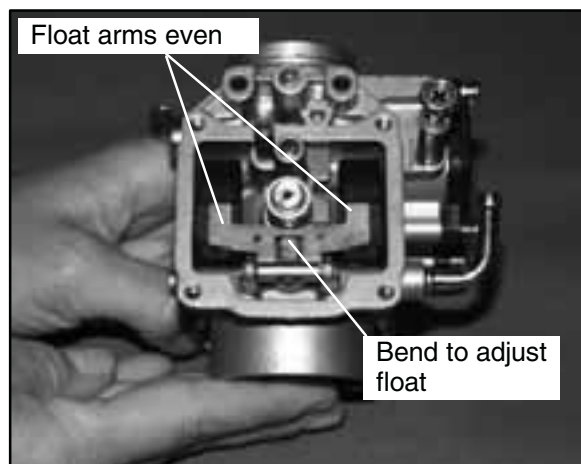
Std: BST 34 13-14 mm (.51-.55 inches)

1. Install the pilot mixture screw, spring, washer, and O-ring as an assembly. Lubricate the O-Ring with oil or light grease before installation. **CAUTION:** Do not damage the O-ring during installation. Turn the screw in until it *lightly* contacts the seat. Back out the specified number of turns. **NOTE:** The final pilot (idle) mixture must be adjusted with the engine running. Refer to Page 2.15.

2. Measure the height from the float bowl mating surface to the top of step in float as shown. Both sides of float should be parallel to each other. The measurement should be made at the mid-point on the top of the float using Float Adjustment Tool (PN 2872314) or a vernier caliper. When measuring the height be sure the inlet needle valve spring is not compressed.

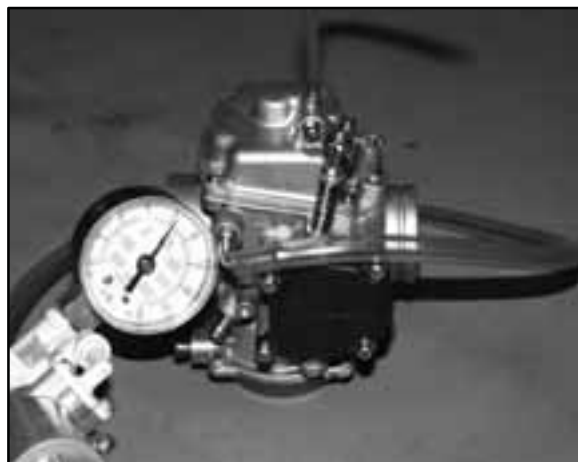


3. If adjustment is necessary, bend the tongue slightly. Be sure float measurement is even on left and right side.



NEEDLE AND SEAT LEAKAGE TEST

1. Install the float bowl. Invert the carburetor and install a Mity-Vac™ (PN 2870975) to the fuel inlet fitting. Apply 5 PSI pressure to inlet fitting. The needle and seat should hold pressure indefinitely. If not, inspect needle and seat and seat O-ring.



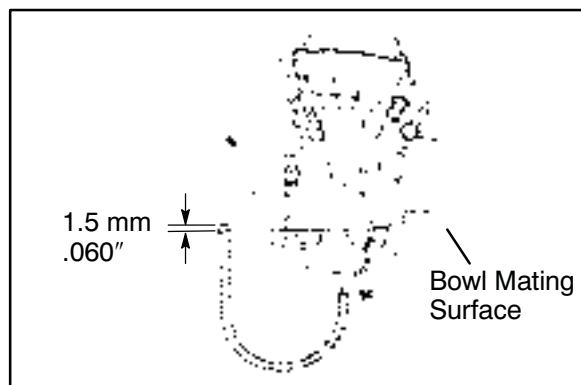
Mity Vac™ (PN 2870975)



FUEL LEVEL

A fuel level test can be performed on some models if the drain hose fitting is accessible. Be sure to re-attach the bowl drain hose after performing the test. A fuel level test allows you to observe the height of the fuel in the float bowl without removing the carburetor. The fuel level can be observed with the engine either running or shut off, however, engine must run briefly to allow fuel level to stabilize..

1. Attach a clear line to drain fitting. Be sure line fits tightly on fitting. Position hose along side of carburetor as shown.



2. Open bowl drain screw by turning counterclockwise approximately two turns. Start and run engine for 3 to 5 seconds to allow fuel level to stabilize in the line. If level is out of specification, remove carburetor and inspect inlet needle and seat, float height, passages, etc.

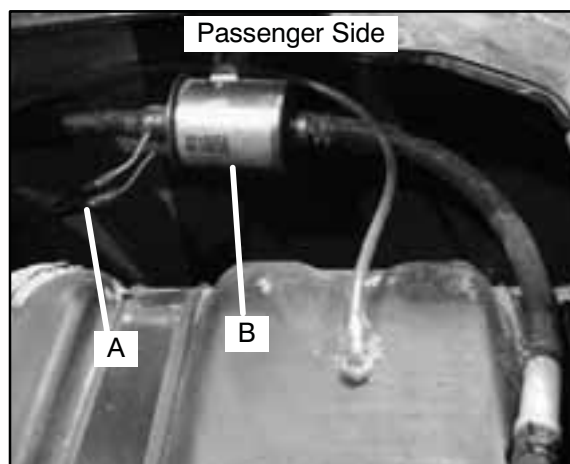
NOTE: If a line was removed to perform this procedure, it must be replaced.

FUEL PUMP REMOVAL/INSTALLATION

1. Remove the seat.
2. Disconnect the fuel pump wiring harness (A).
3. Remove the fuel line clamps and remove the fuel lines from each side of the fuel pump (B).
4. Remove two screws that secure the fuel pump (B) to the main floor.
5. To install the fuel pump (B), repeat Step 1 through Step 4 in reverse order.

CAUTION:

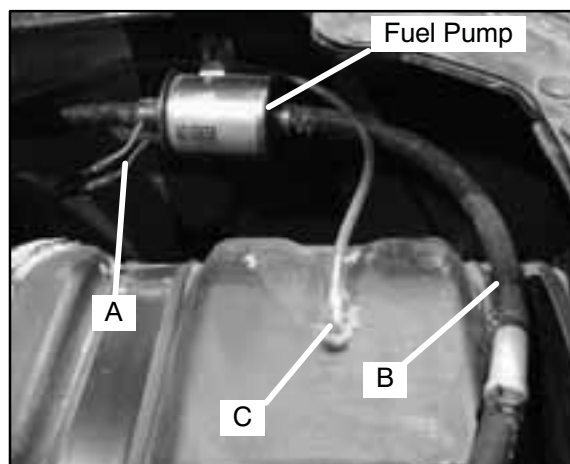
Be careful not to damage fuel pump.



FUEL TANK REMOVAL/INSTALLATION

1. Remove the seat.
2. Disconnect the negative battery cable.
3. Disconnect the fuel pump wiring harness (A).
4. Remove the fuel lines (B) and remove the tank vent line (C).

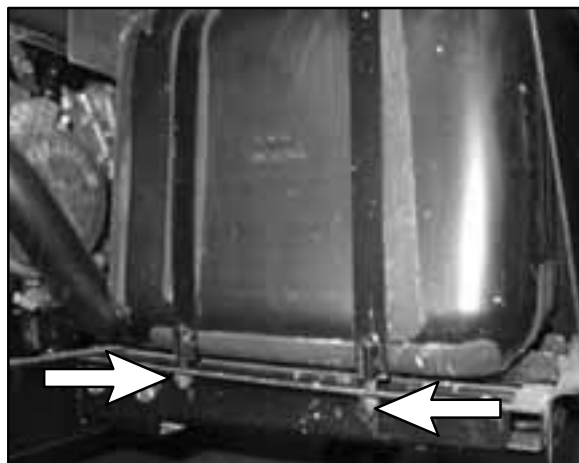
NOTE: Mark or tag the hoses for correct installation of the hoses.





5. Remove the two nuts that secure the tank straps.
6. Pull the straps over the tank. Slide the gas tank out of the tank support.

NOTE: The side panel on the right side of the fuel tank may have to be loosened to ease the removal of the fuel tank.



TROUBLESHOOTING

FUEL STARVATION/LEAN MIXTURE

Symptoms: Hard start or no start, bog, backfire, popping through intake / exhaust, hesitation, detonation, low power, spark plug erosion, engine runs hot, surging, high idle, idle speed erratic.

- No fuel in tank
- Restricted tank vent, or routed improperly
- Fuel lines or fuel valve restricted
- Fuel filter plugged
- Carburetor vent line(s) restricted
- Plugged or restricted inlet needle and seat screen or inlet passage
- Clogged jets or passages
- Float stuck, holding inlet needle closed or inlet needle stuck
- Float level too low
- Fuel pump inoperative
- Air leak at impulse line
- Restricted impulse line (kinked, pinched)
- Intake air leak (throttle shaft, intake ducts, airbox or air cleaner cover)
- Ruptured vacuum slide diaphragm, Vacuum slide stuck closed or sticky
- Improper spring

- Jet needle position incorrect
- Incorrect pilot screw adjustment

RICH MIXTURE

Symptoms: Fouls spark plugs, black, sooty exhaust smoke, rough idle, poor fuel economy, engine runs rough/ misses, poor performance, bog, engine loads up, backfire.

- Air intake restricted (inspect intake duct)
- Air filter dirty/plugged
- Choke plunger sticking, incorrectly adjusted choke
- Choke cable binding or improperly routed
- Incorrect pilot air/fuel screw adjustment
- Faulty inlet needle and seat
- Faulty inlet needle seat O-Ring
- Float level too high
- Poor fuel quality (old fuel)
- Loose jets
- Worn jet needle/needle jet or other carburetor parts
- Dirty carburetor (air bleed passages or jets)
- Weak or damaged vacuum piston return spring
- Fouled spark plug

POOR IDLE

Idle Too High

- Idle adjusted improperly/idle mixture screw damaged
- Sticky vacuum slide
- Throttle cable sticking, improperly adjusted, routed incorrectly
- Choke cable sticking, improperly adjusted, routed incorrectly
- Plugged or restricted idle jet

Idle Too Low

- Choke cable bending or incorrectly adjusted
- Idle speed set incorrectly
- Idle mixture screw misadjusted or damaged
- Belt dragging
- Ignition timing incorrect

- ## NOTES

- Choke cable binding or incorrectly adjusted
- Throttle cable incorrectly adjusted
- Air leaks, dirty carburetor passages (pilot circuit)
- Pilot mixture screw damaged or adjusted incorrectly
- Tight valves
- Ignition timing incorrect
- Belt dragging
- Dirty air cleaner
- Engine worn
- Spark plug fouled
- Idle speed set incorrectly (speed limiter)
- Worn jet needle/needle jet
- Plugged or restricted idle jet

[illegible]



CHAPTER 5

BODY AND STEERING

Torque Specifications and Special Tools	5.2
Body / Panel Removal	5.3
Cab Frame & Seat Exploded View	5.4
Frame / Body Assembly Exploded View	5.5
Body Molding Exploded View	5.6
Hood Exploded View	5.7
Cargo Box Exploded View	5.8
Dash Instruments & Controls	5.9
Steering Assembly Exploded View	5.1
A-Arm / Strut Exploded View	5.11
A-Arm Replacement	5.12
Middle A-Arm Replacement (6x6)	5.13
Rear Axle & Swingarm	5.14
Swing Arm Removal & Installation	5.15
Strut Assembly Exploded View	5.16
Front Strut Cartridge Replacement	5.17
Front Strut Ball Joint Replacement	5.17-5.18
Box Removal / Installation	5.19
Decal Replacement	5.20



TORQUE SPECIFICATIONS

ITEM	TORQUE VALUE
Front A-Arm Attaching Bolt	30 ft. lbs. (41 Nm)
Front A-Arm Ball Joint Stud Nut	25 ft. lbs. (35 Nm)
Handlebar Adjuster Block	10-12 ft. lbs. (14-17 Nm)
Master Cylinder	45-55 in. lbs. (5.2-6.3 Nm)
Rear Shock Bolt (upper)	25 ft. lbs. (34 Nm)
Rear Shock Bolt (lower)	25 ft. lbs. (34 Nm)
Rear Wheel Hub Nut	110 ft. lbs. (150 Nm)
Rear Wheel Nuts	35 ft. lbs. (48 Nm)
Upper Stabilizer Support Nut	17 ft. lbs. (24 Nm)
Upper Control Arm Mounting Bolt	35 ft. lbs. (48 Nm)
Lower Control Arm Mounting Bolt	30 ft. lbs. (41 Nm)
Upper Wheel Bearing Carrier Bolt	35 ft. lbs. (48 Nm)
Lower Wheel Bearing Carrier Bolt	30 ft. lbs. (41 Nm)
Strut Rod Retaining Nut (Top)	15 ft. lbs. (21 Nm)

Strut Casting Pinch Bolt	15 ft. lbs. (21 Nm)
Tie Rod End Jam Nut	12-14 ft. lbs. (17-19 Nm)
Tie Rod End Castle Nut	40-45 ft. lbs. (54-61 Nm)
Tie Rod End Attaching Bolt	25-30 ft. lbs. (35-41 Nm)

NOTE: Refer to exploded views throughout this chapter for identification and location of components.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Strut and Ball Joint Tool Set	2870871
Shock Spanner Wrench	2870872
Shock Spring Compressor Tool	2870623
Strut Spring Compressor Tool (LH)	2871573
Strut Spring Compressor Tool (RH)	2871574



BODY/PANEL REMOVAL

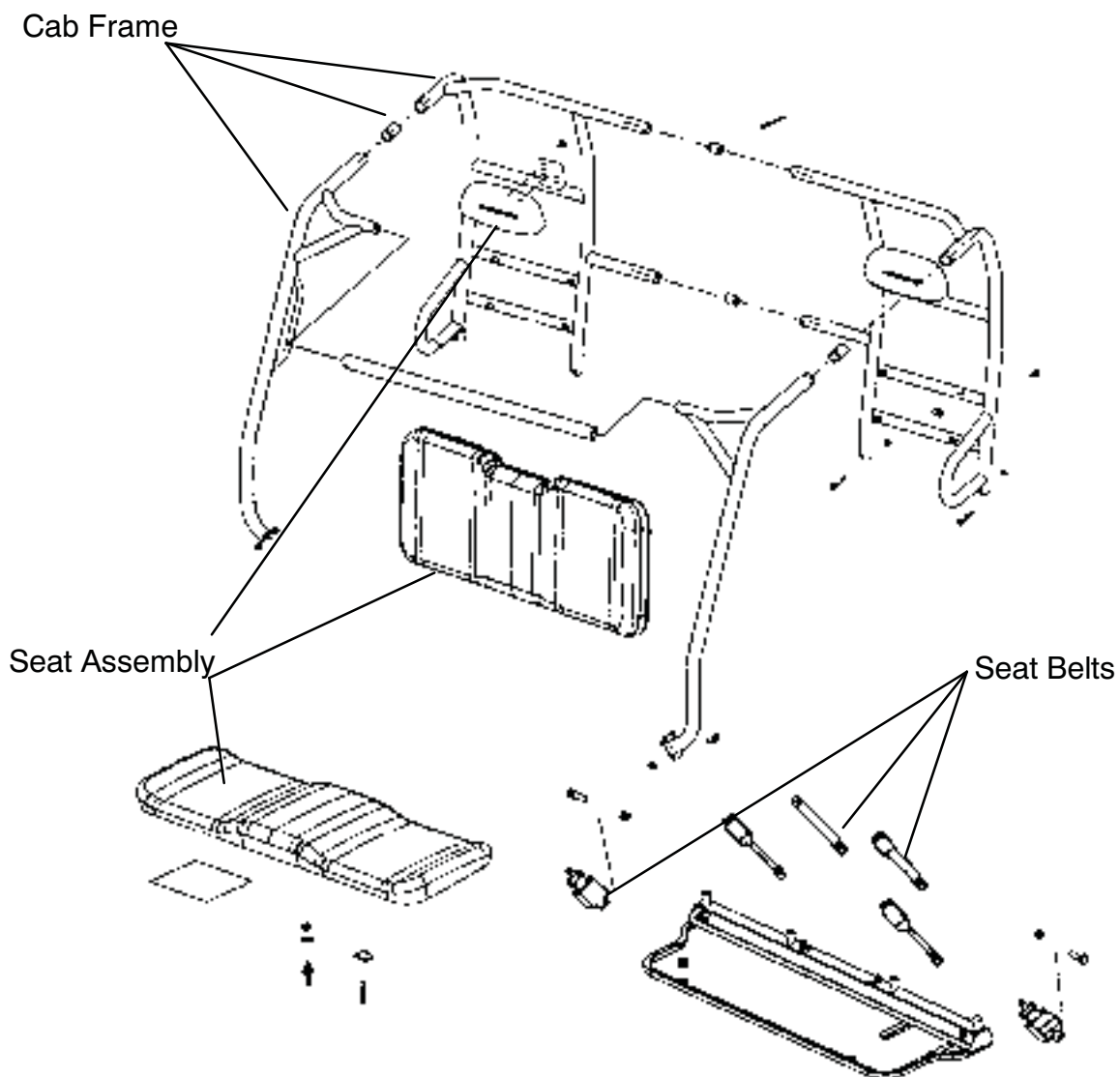
To Remove:**Perform These Steps:**

- Seat Remove: Pull up on front of seat and then pull forward
- Console Remove: Gear selector handle
Console Screws
Disconnect dash component wires
Steering wheel (1 nut)
Rivets
- Hood Disconnect: Headlights
4 hinge screws
- Cab Remove: Seats
Bolts of front mounts
Bolts for the rear mounts
- Hood Liner Remove: Liner darts
Liner screws
Disconnect wiring harnesses
Remove air baffling boxes
- Front Bumper Remove: Hood
3 front Torx screws from LH and RH wheel well panels
2 top bumper mounting bolts
3 lower bumper mounting bolts
- Cargo Box Place box in the down position
Raise rear of box with assist from dump box shocks
Remove hitch pins from shocks at box
Remove clevis pins
Disconnect light harnesses
Remove (2) screws holding hinge pins
Tap out hinge pins
Lift box off frame with assistance
- Fuel Tank Raise rear box
Disconnect vent and fuel lines (Note locations)
Disconnect electrical connection
Remove tank strap bolts, and tank straps
Lift tank out -through backside of compartment



CAB FRAME & SEAT EXPLODED VIEW

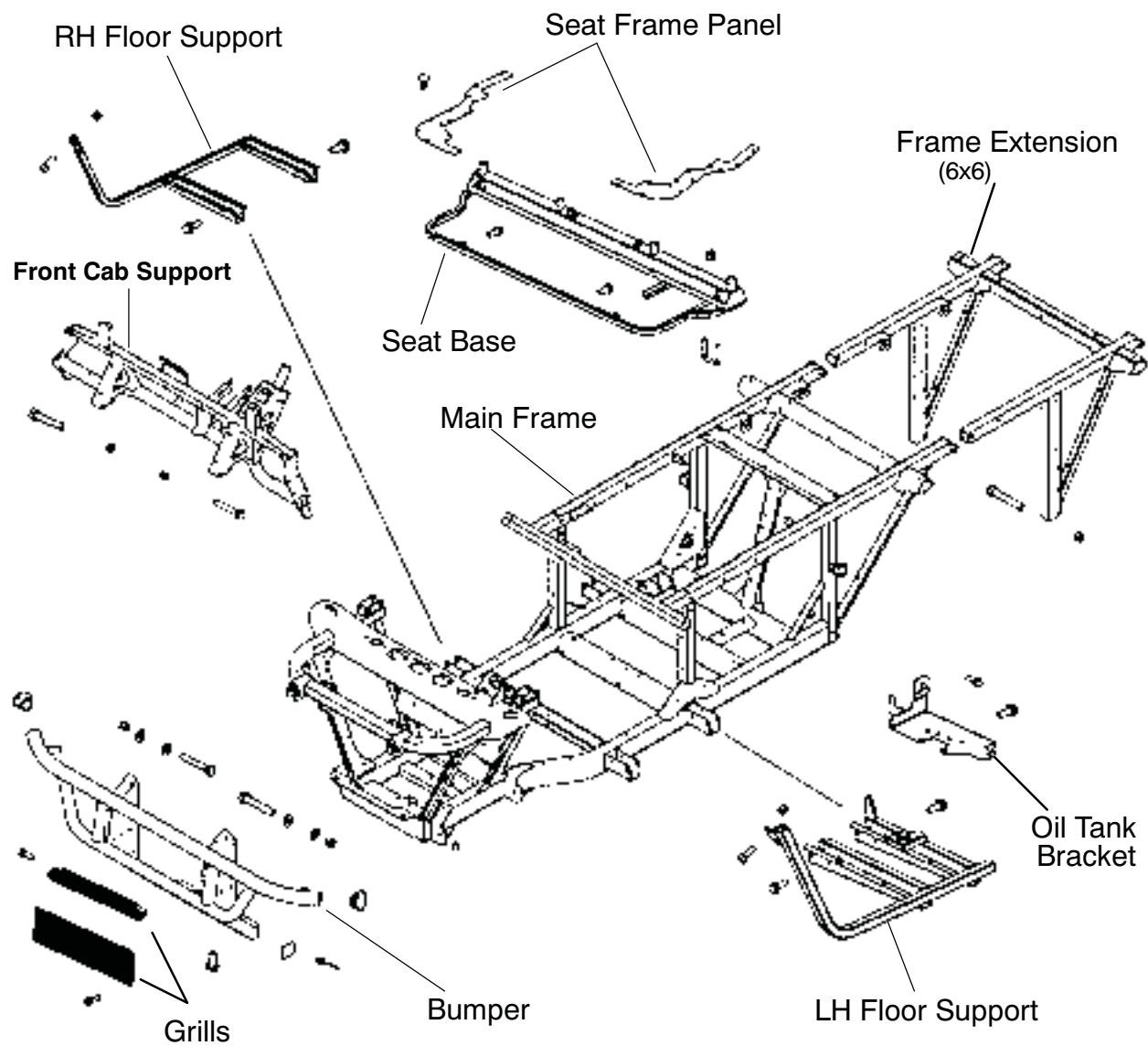
Cab Frame and Seat Assembly





FRAME/BODY ASSEMBLY EXPLODED VIEW

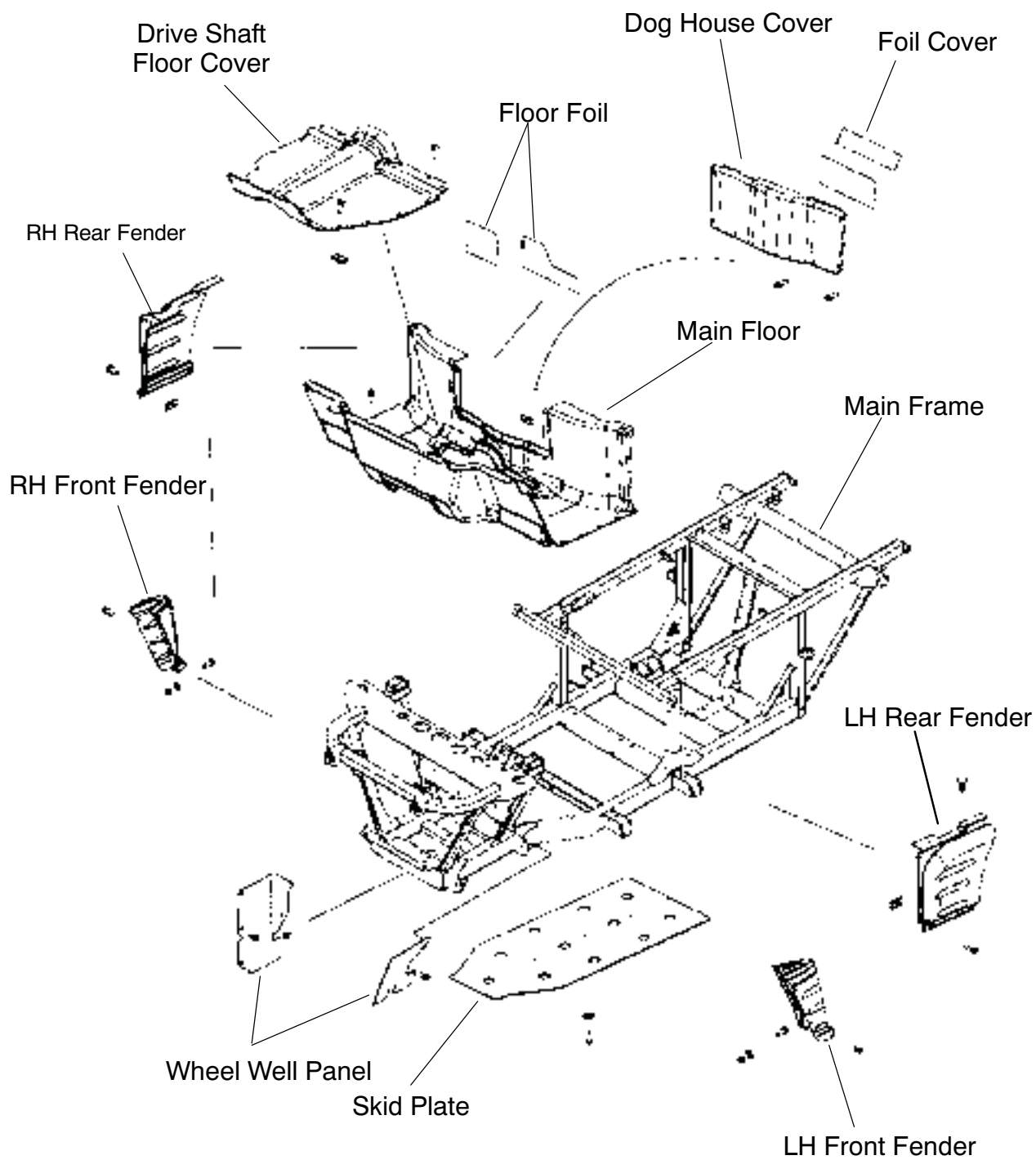
Chassis/Body Assembly





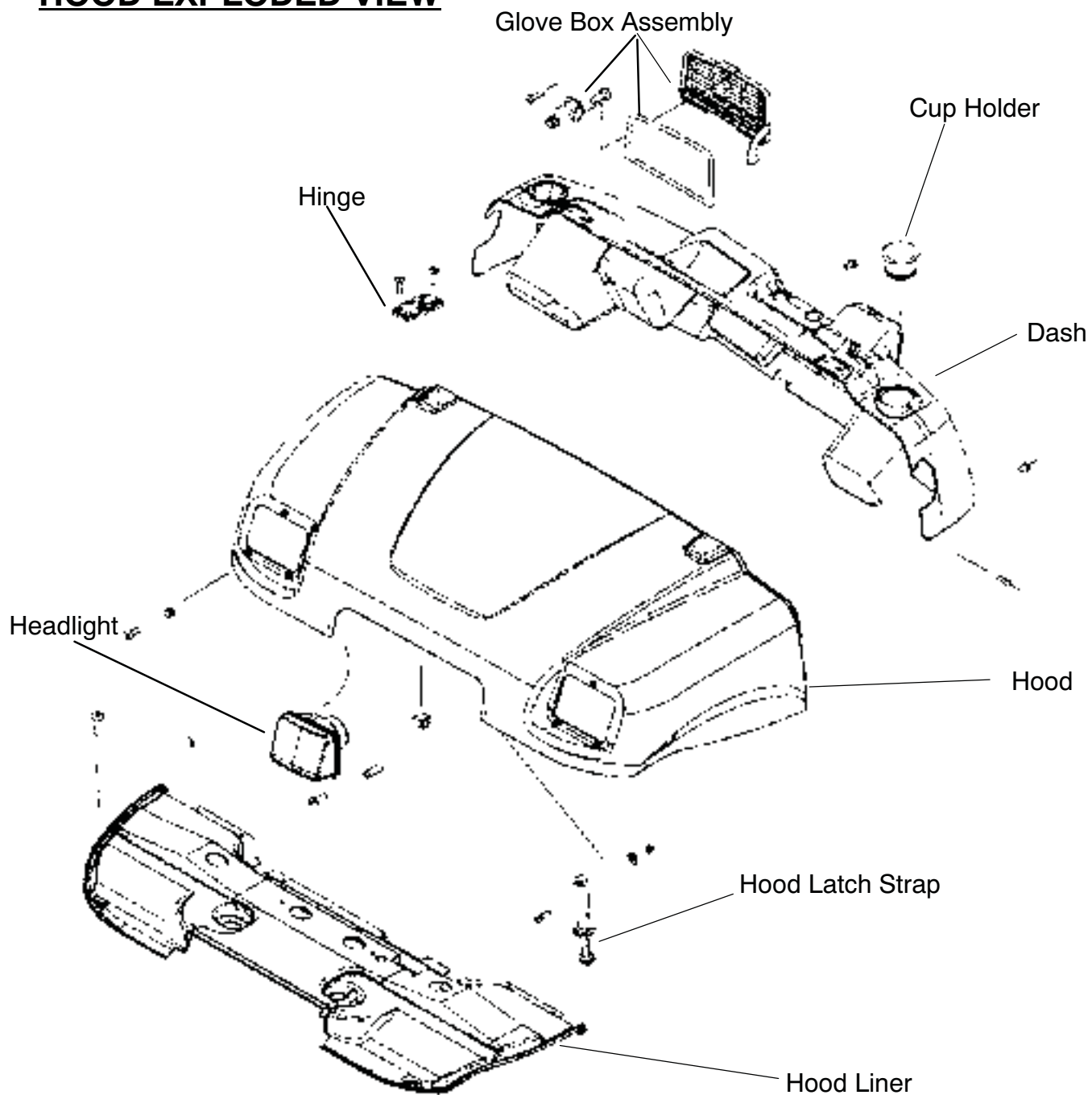
BODY MOLDING EXPLODED VIEW

Body Molding



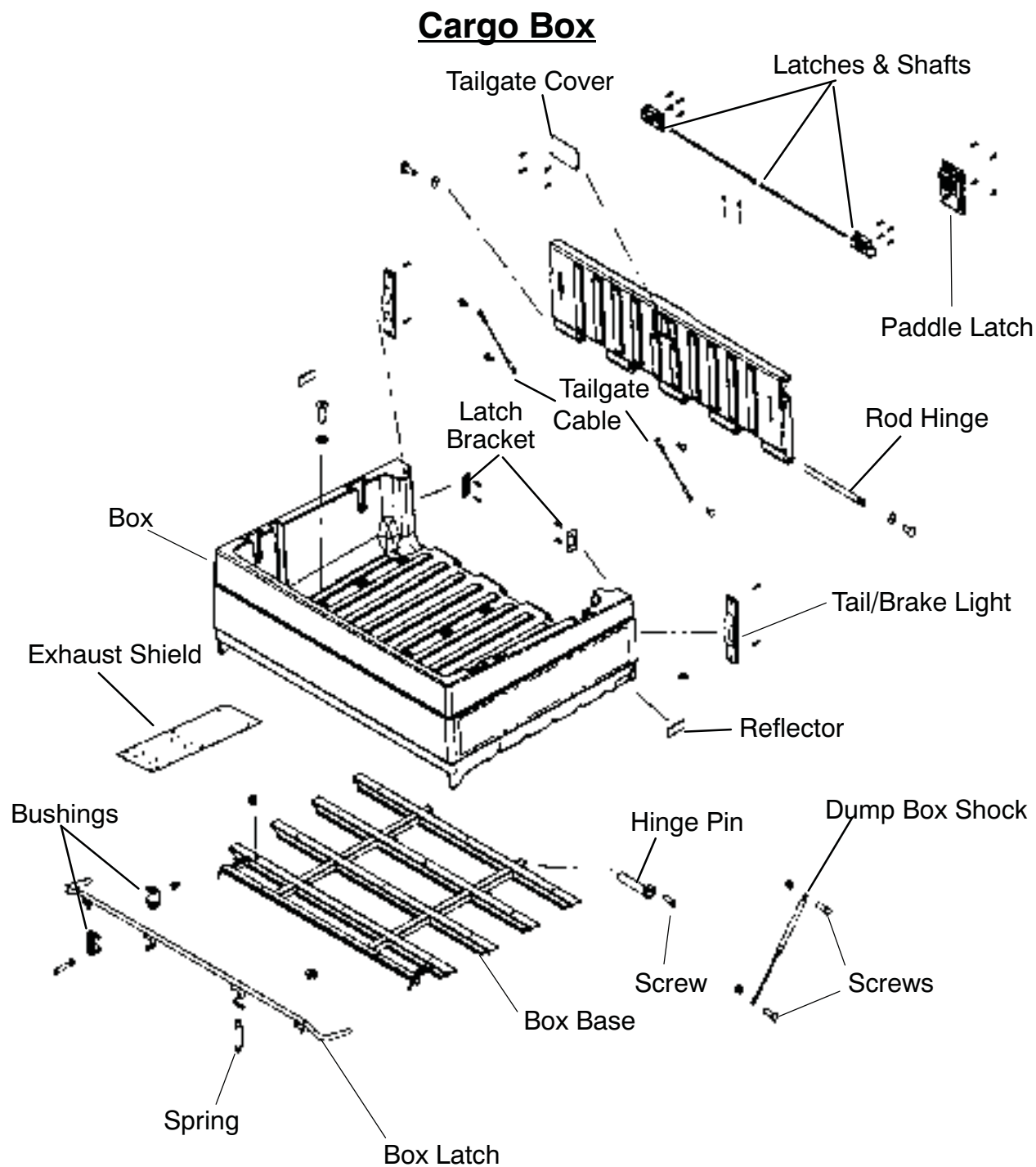


HOOD EXPLODED VIEW





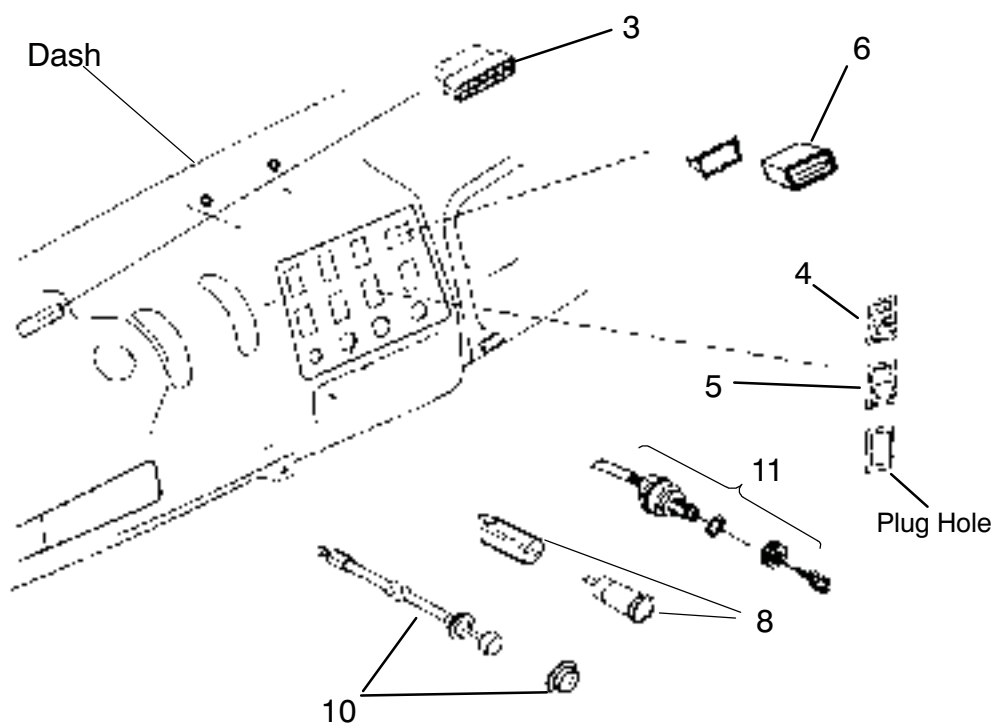
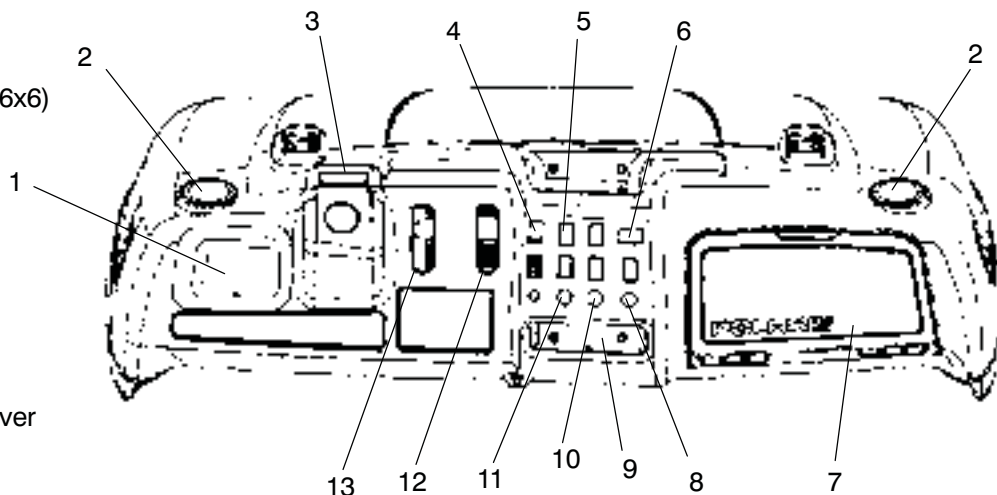
CARGO BOX EXPLODED VIEW





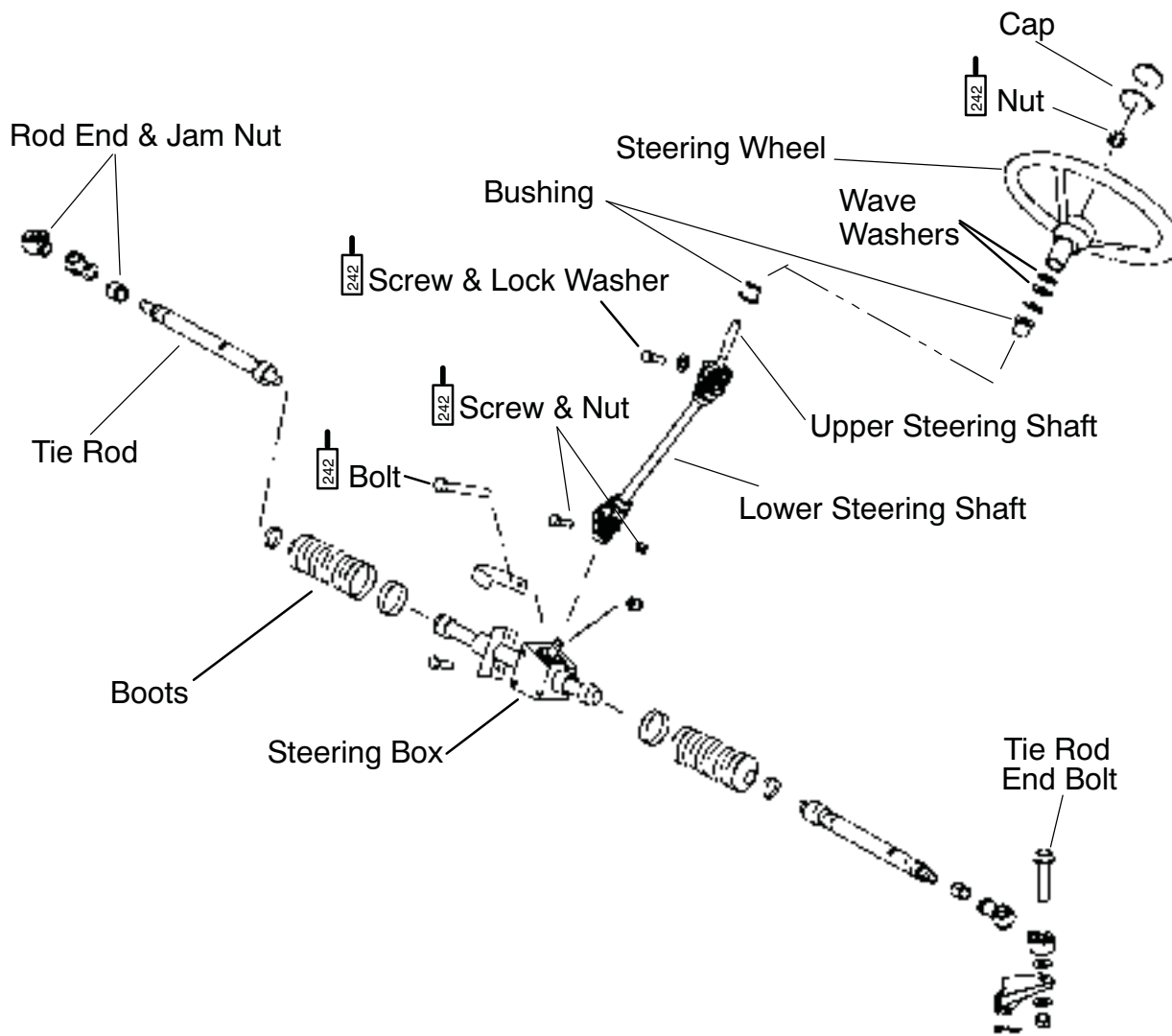
DASH INSTRUMENTS AND CONTROLS

1. Storage Box
2. Cup Holder
3. Indicator Lights
4. Light Switch
5. AWD Switch (4x4 & 6x6)
6. Hour Meter
7. Glove Box
8. 12V Acc. Plug
9. Storage Tray
10. Choke Knob
11. Ignition Switch
12. Shift Lever
13. Differential Lock Lever (2x4 & 4x4)





STEERING ASSEMBLY EXPLODED VIEW



Apply Loctite™ 242






A-ARM/STRUT ASSEMBLY EXPLODED VIEW (All MODELS)

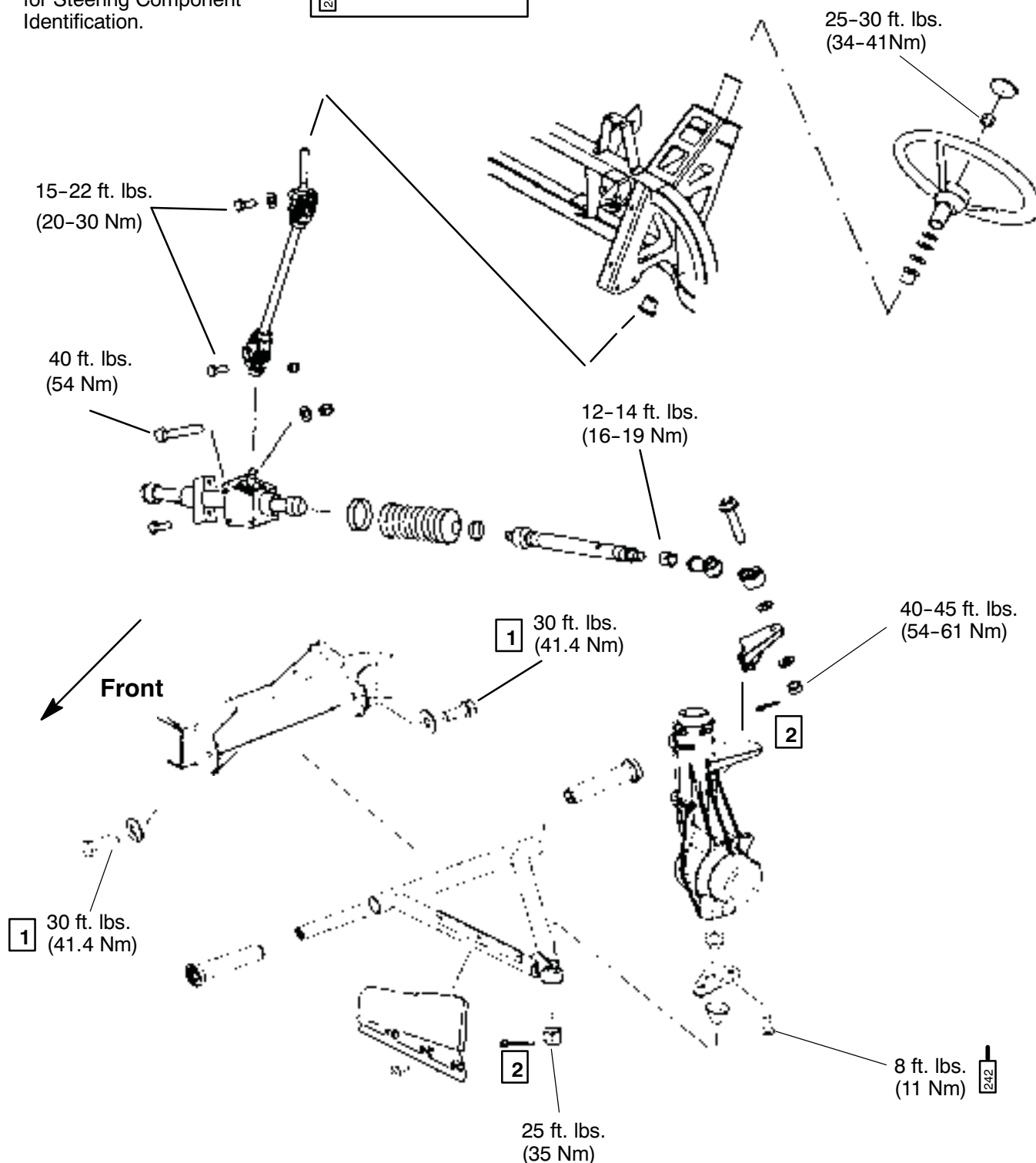
1 Always use new bolts upon reassembly

2 Always use new cotter pins upon reassembly.

NOTE: Refer to Page 5.10 for Steering Component Identification.

 Apply Loctite™ 242

NOTE: To avoid damage to the tie rod ends and other steering components, be sure to install tie rod end bolts in the proper direction. The steering post arm bolt (B) points up; the rod end bolts (A) point down. Be sure inner rod ends are placed between the steering post arms.

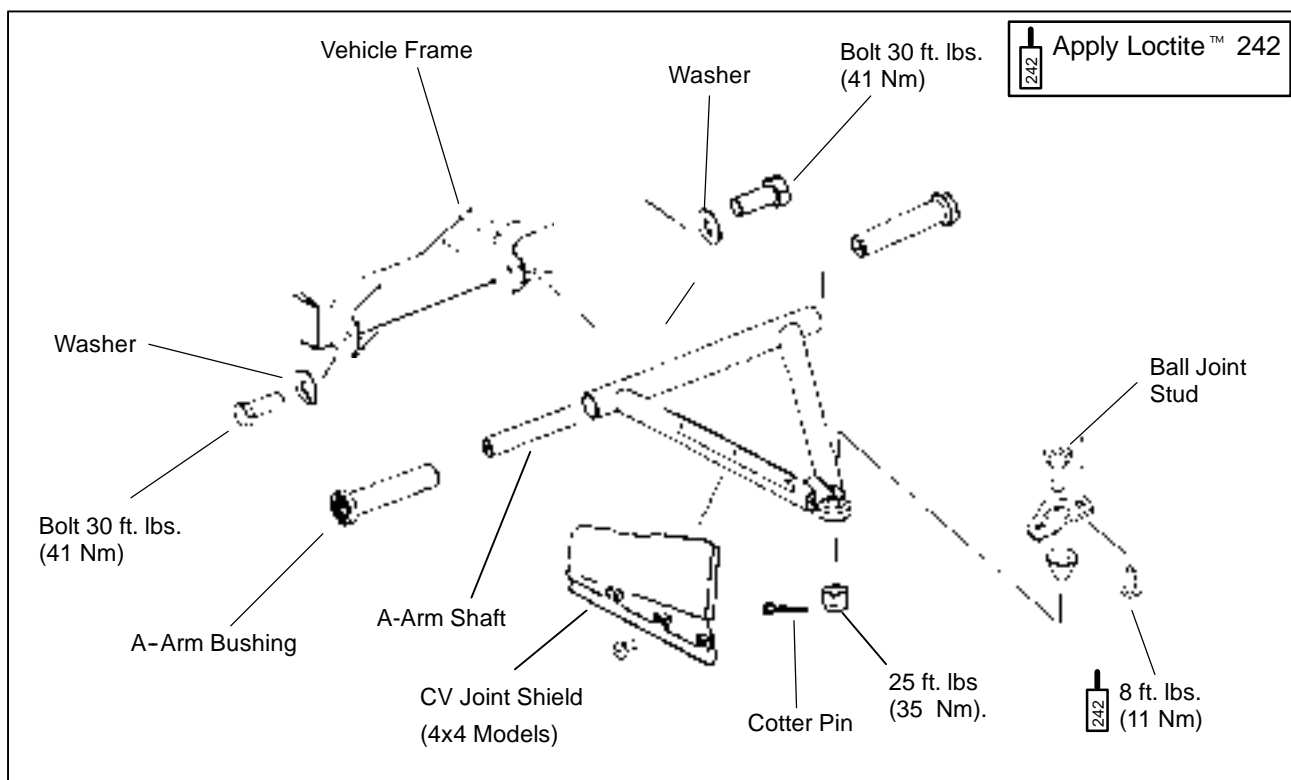




A-ARM REPLACEMENT (ALL MODELS)

1. Elevate and safely support vehicle with weight removed from front wheel(s).
2. Remove cotter pin from ball joint stud at wheel end of A-arm and loosen nut until it is flush with end of stud.
3. Using a soft face hammer, tap nut to loosen A-arm from bolt. Remove nut and A-arm from hub strut assembly.
4. Loosen two bolts on A-arm bushing by alternating each about 1/3 of the way until A-arm can be removed.
5. Examine A-arm bushing and A-arm shaft. Replace if worn. Discard hardware.
6. Insert A arm bushings and A-arm shaft into new A-arm.

NOTE: On AWD models, install CV joint shields. See Illustration



7. Install new A-arm assembly onto vehicle frame. Torque new bolts to 30 ft. lbs. (41.4 Nm).

⚠ WARNING

The locking features on the existing bolts were destroyed during removal. **DO NOT** reuse old bolts. Serious injury or death could result if fasteners come loose during operation.

8. Attach A-arm to hub strut assembly. Tighten ball joint nut to 25 ft. lbs. (35 Nm). If cotter pin holes are not aligned, tighten nut slightly to align. Install a new cotter pin with open ends toward rear of machine. Bend both ends in opposite directions around nut.

⚠ WARNING

Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.

A-arm Attaching Bolt Torque:

30 ft. lbs. (41 Nm)

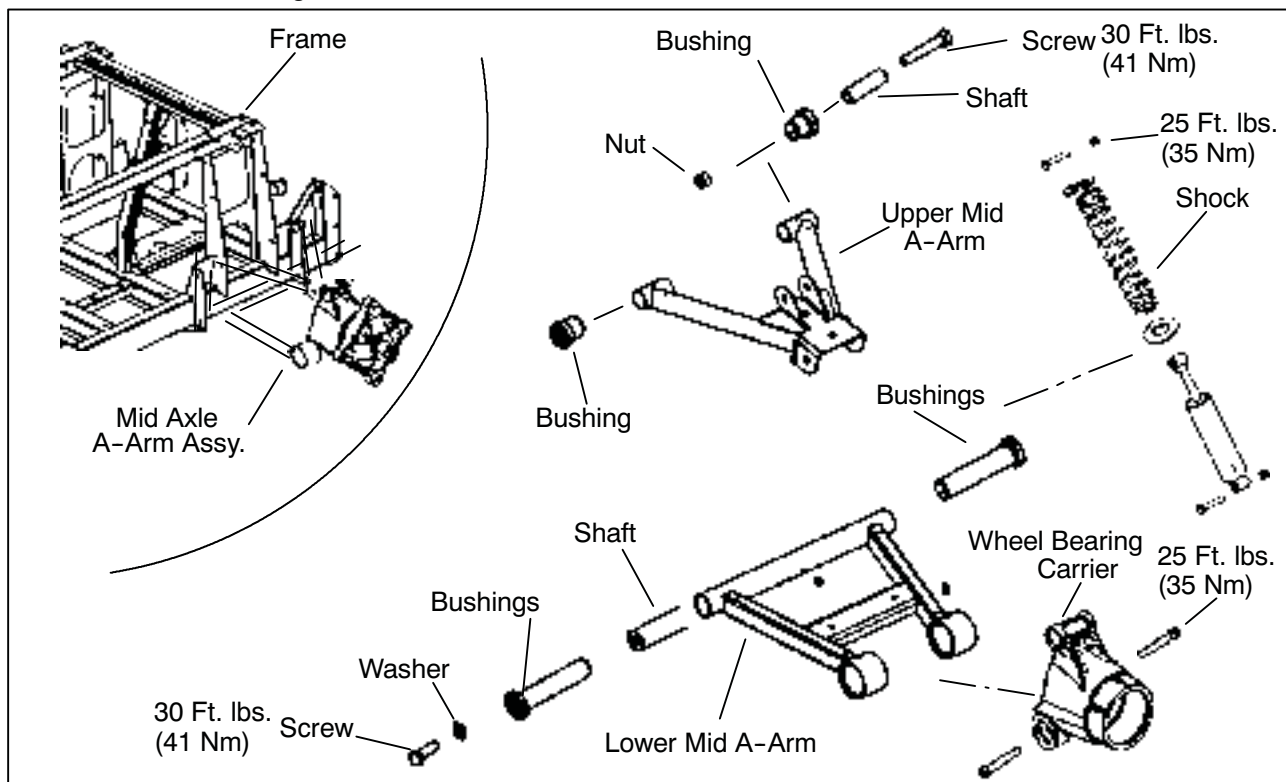
Ball Joint Stud Nut Torque:

25 ft. lbs. (35 Nm)



MID AXLE A-ARM REPLACEMENT (6X6)

1. Elevate and safely support the center of the vehicle with weight removed from center wheel(s).
2. Remove the bolts that secure the shock to the upper and lower mid A-arms.
3. Loosen two bolts on A-arm bushing by alternating each about 1/3 of the way until A-arm can be removed. Perform this procedure on the upper and lower mid A-arms.
4. Examine the A-arm bushing and A-arm shaft. Replace if worn. Discard hardware.
5. Insert A-arm bushings and A-arm shaft into new A-arm.



6. Install new lower mid A-arm assembly onto vehicle frame. Torque new bolts to 30 ft. lbs. (41.4 Nm).
7. Install a new upper mid A-arm assembly. Torque new bolts to 30 ft. lbs. (41.4 Nm).

⚠ WARNING

The locking features on the existing bolts were destroyed during removal. **DO NOT reuse old bolts.** Serious injury or death could result if fasteners come loose during operation.

8. Attach A-arm to wheel bearing carrier. Torque bolts to 25 ft. lbs. (35 Nm). Install the shock to the upper mid A-arm. Torque bolts to 25 ft. lbs. (35 Nm).
9. Locate grease fitting in center of A-arm tube and pump A-arm full of grease.

⚠ WARNING

Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.

A-arm Attaching Bolt Torque:

30 ft. lbs. (41 Nm)

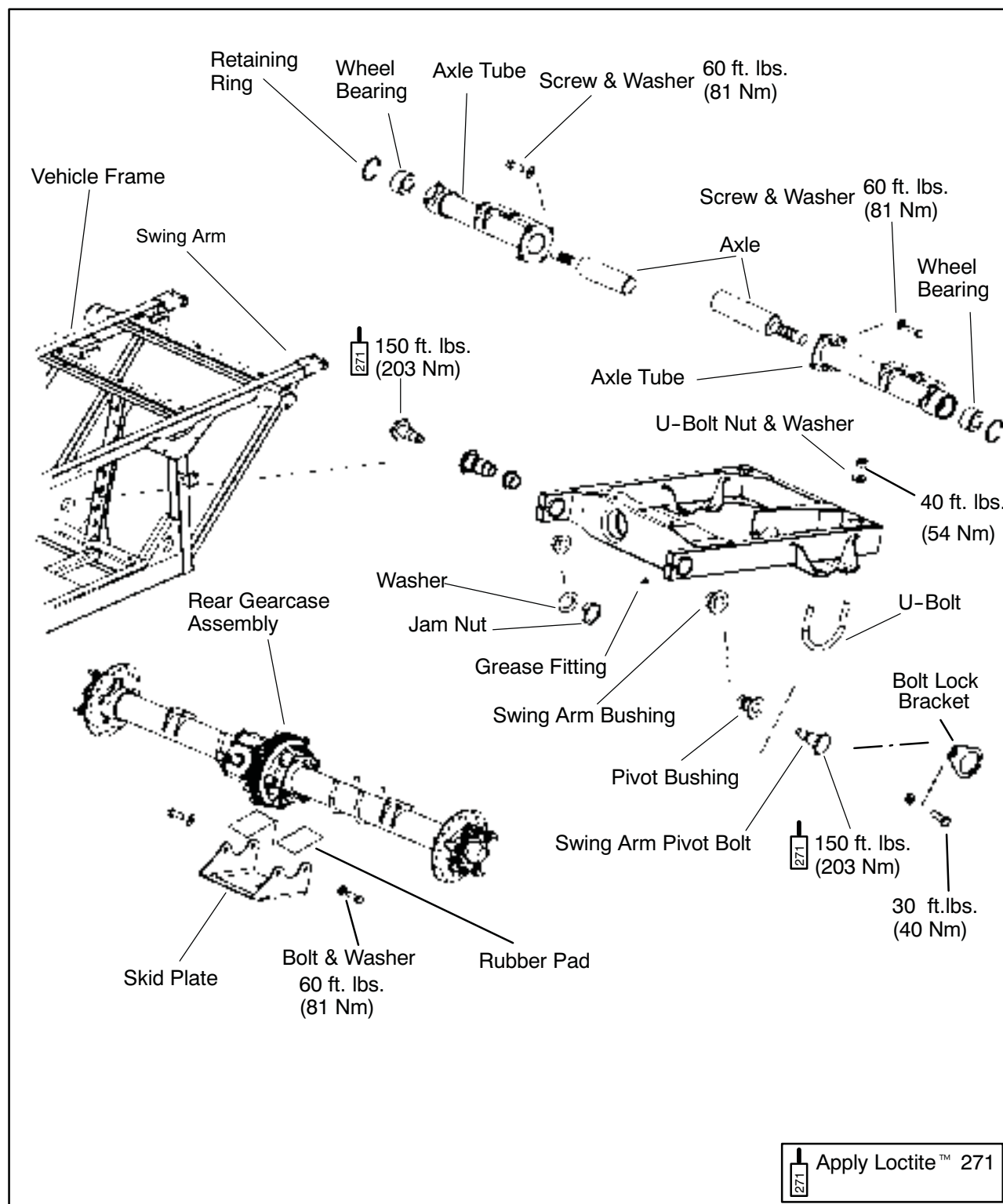
Wheel Bearing Carrier Bolt Torque:

25 ft. lbs. (35 Nm)





REAR DRIVE AXLE AND SWINGARM (ALL MODELS)





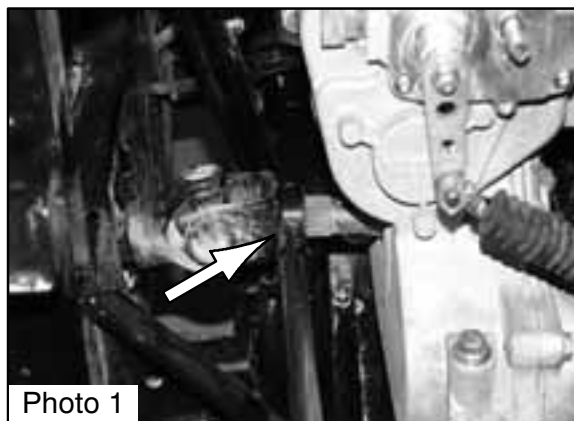
SWING ARM REMOVAL AND INSTALLATION

Swing Arm Removal

1. Support machine on a level surface.
2. Remove rear wheels.

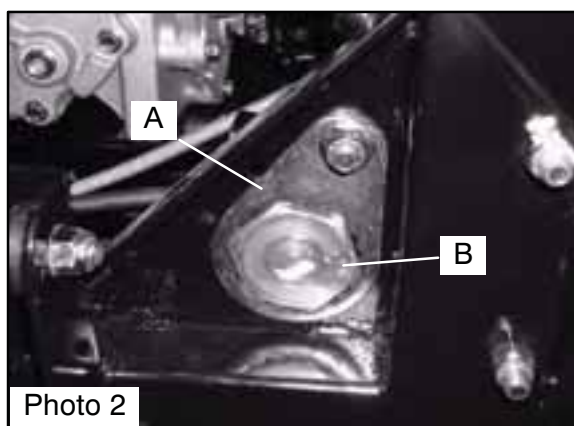
NOTE: The rear axle may be removed to ease the removal of the swing arm. Refer to Chapter 7, REAR AXLE HOUSING REMOVAL/INSPECTION.

3. Support swing arm, remove rear axle shocks.
4. Drive spring pin out of rear propshaft at middle angle drive using the Roll Pin Removal Tool (PN **2872608**) (Photo 1).



5. Remove the pivot bolt lock brackets (A), swing arm pivot bolts (B), bolts swing arm bushings, lower swing arm and rear axle. (Photo 2)

NOTE: Use jacks and jackstands to help remove the the swing arm assembly.

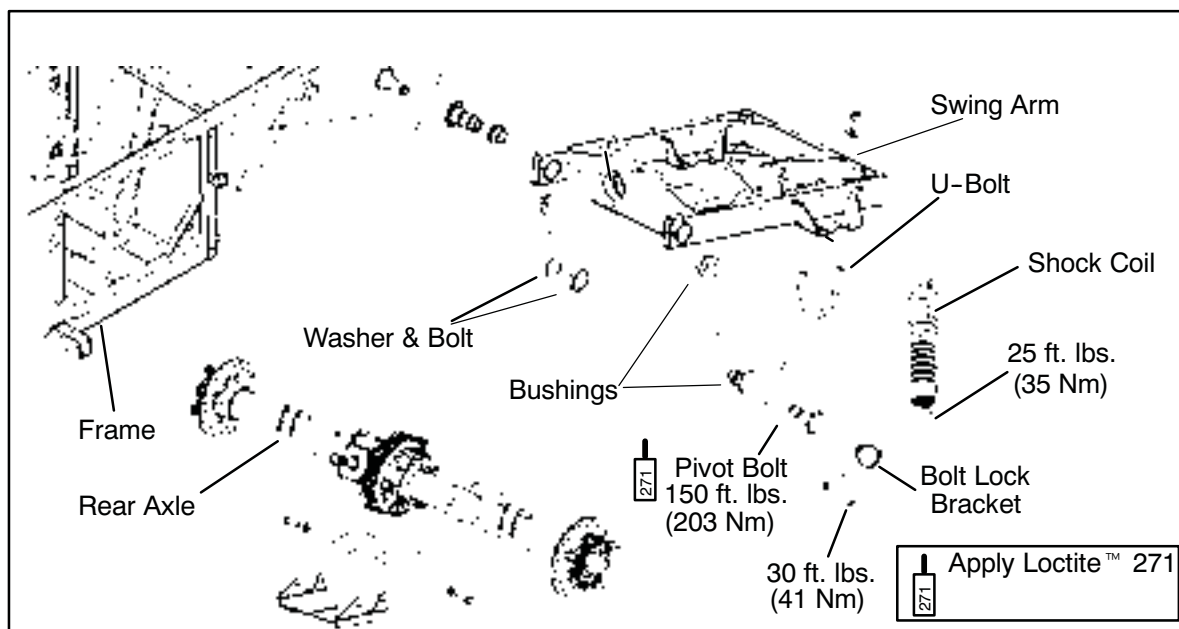


Swing Arm Installation

6. Raise swing arm assembly and align the drive shaft to the rear gearcase splined shaft. (Lube splines)
7. Insert new bushings, check pivot bolts for wear, replace if necessary, torque bolts to 150 ft. lbs (75.9 Nm). Install bolt lock brackets and bolts, torque to 30 ft. lbs. (41 Nm).
8. Install rear coil over shocks onto swing arm, torque bolts to 25 ft. lbs (35 Nm).
9. Install rear wheels, lower machine.
10. Insert new spring pin on rear propshaft.

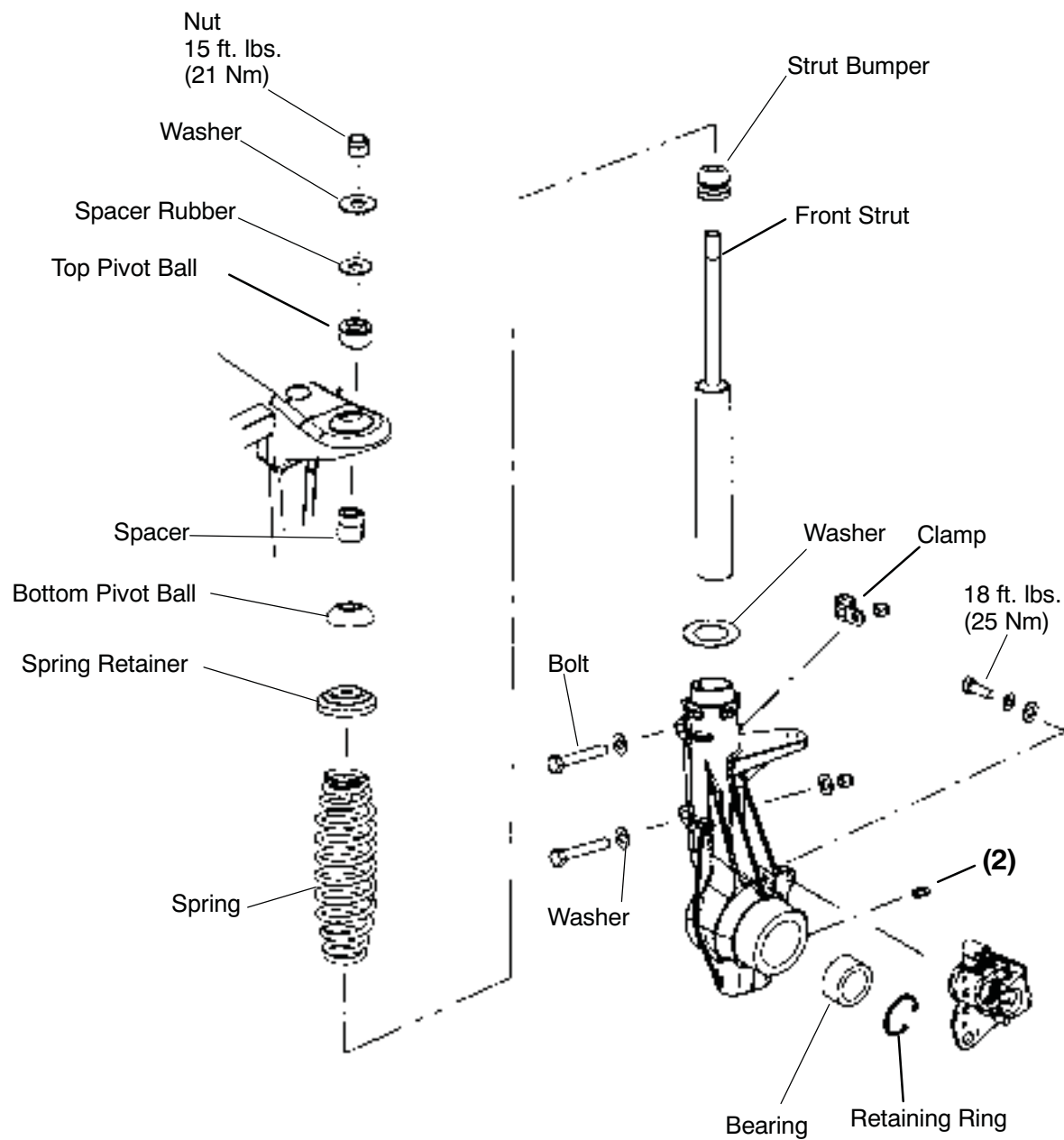
Pivot Bolt and Nut Torque:
150 ft. lbs. (75.9 Nm)

Rear Coil Over Shock Mount Bolt Torque: 25 ft. lbs. (35 Nm)





STRUT ASSEMBLY



NOTE: Grease fitting (2) location. Check lubrication guide for recommended service intervals.



FRONT STRUT CARTIDGE REPLACEMENT

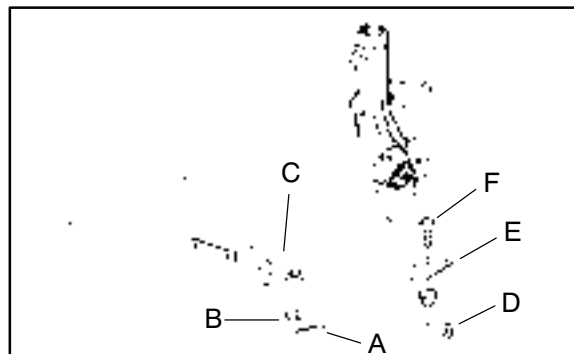
Refer to Illustration on Page 5.16.

1. Hold strut rod and remove top nut.
2. Compress spring using strut spring compressor tools.

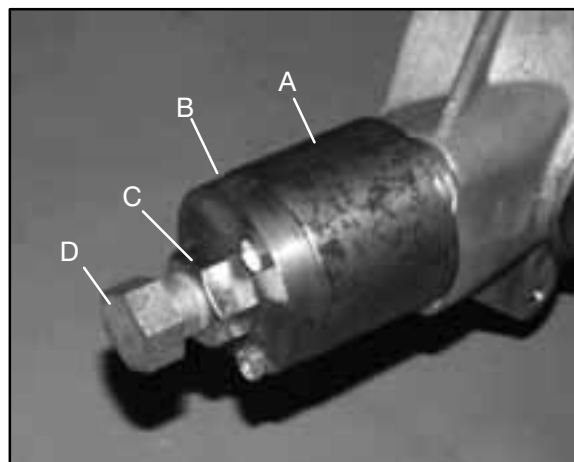
Strut Spring Compressor Tools
(PN 2871573) and (PN 2871574)

3. Remove upper strut pivot assembly.
4. Remove coil spring and collapse strut cartridge.
5. Remove two pinch bolts from strut casting.
6. Remove strut cartridge.
7. Install cartridge until bottomed in strut casting.
8. Install pinch bolts with wire clamp(s). Torque pinch bolts to 15 ft. lbs. (21 Nm).
9. Reassemble spring and top pivot assembly. Be sure all parts are installed properly and seated fully.
10. Torque strut rod nut to specification. Do not over torque nut.

Strut Rod Nut Torque
15 ft. lbs. (21 Nm)



7. Using ball joint removal / installation tool kit (**PN 2870871**), remove ball joint (F) from strut housing. Refer to photos at right.
 - Install puller guide (A) with extension cap (B).
 - Apply grease to extension cap and threads of puller bolt to ease removal.
 - Thread bolt (D) with nut (C) onto ball joint stud as shown.
 - Apply heat to ease removal.
 - Hold bolt (D) and turn nut (C) clockwise until ball joint is removed from strut housing.



BALL JOINT REPLACEMENT

REFER TO ILLUSTRATION ON PAGE 5.16.

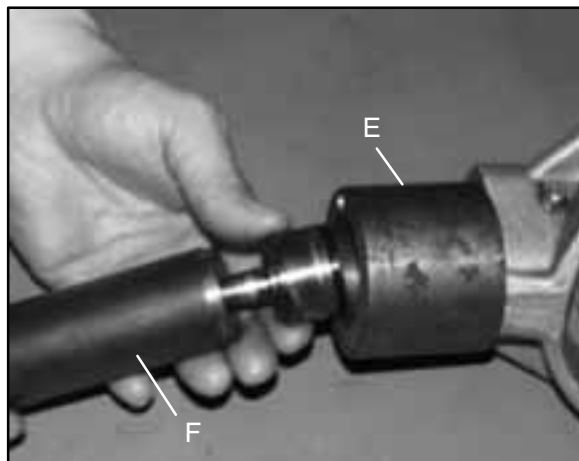
1. Loosen front wheel nuts slightly.
2. Elevate and safely support machine under footrest/frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

3. Remove wheel nuts and wheels.
4. Remove cotter pin (A) from ball joint castlenut.
5. Remove castle nut (B) and separate A-arm (C) from ball joint stud.
6. Remove screws (D) and ball joint retaining plate (E).

8. To install new ball joint:
 - Remove extension cap and attach puller guide using short bolts provided in the kit.
 - Insert new ball joint (E) into driver (F).
 - Slide ball joint/driver assembly into guide.
 - Apply heat to ease installation.
 - Drive new joint into strut housing until fully seated.





9. Apply Loctite™ 242 (**PN 2871949**) to threads of retaining plate screws or install new screws with pre-applied locking agent. Torque screws to 8 ft. lbs. (11 Nm).
10. Install A-arm on ball joint and torque castle nut to 25 ft. lbs. (35 Nm).
11. Reinstall cotter pin with open ends toward rear of machine.

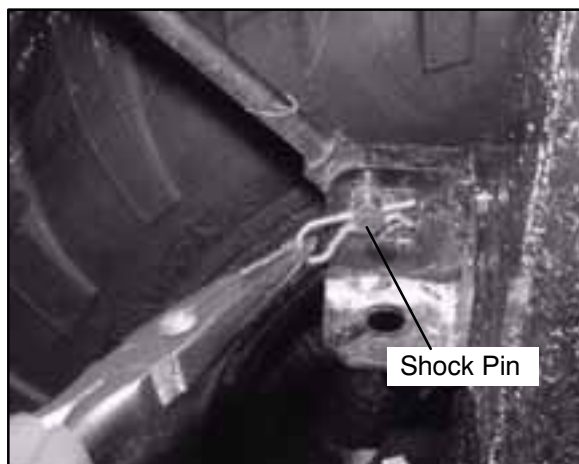


BOX REMOVAL / INSTALLATION

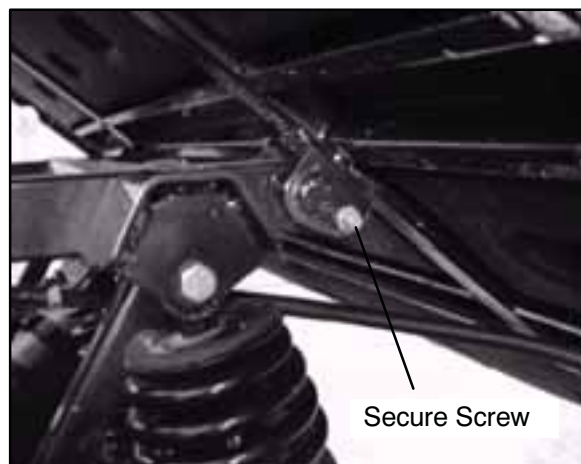
Box Removal

1. Lift the box into the dump position.
2. Remove the box shock pin from the frame (both sides).
3. Remove the shocks from the shock brackets. Let the shocks fully extend.

CAUTION: Safely support the box during the rest of the removal process. The box is not as stable with the shocks removed.



4. Remove the screw that secures the hinge pin to the frame (both sides).



5. Remove the hinge pin (both sides).

CAUTION: Safely support the box during the rest of the removal process. The box is not as stable with the hinge pins removed.

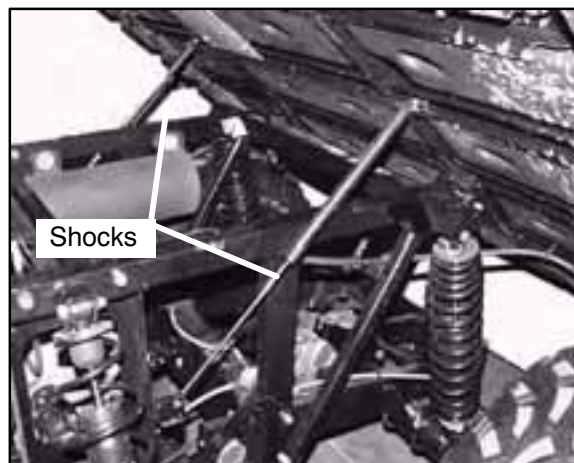


6. With both hinge pins removed, remove the box from the frame. Two people maybe needed to remove the bed from the frame.

CAUTION: Use caution when removing the box. It is recommended to have two people to carefully remove the box from the frame.

Box Installation

1. Place the box onto the frame. Align the hinges of the box with the bracket on the frame.
2. Install the box hinges (both sides).
3. Secure the box hinges with the hinge screws (both sides).
4. With the hinges installed, decompress the box shocks and place them into the shock brackets on the frame (both sides).
5. Secure the box shocks with the shock pin (both sides).



6. Lower the box and secure the latch.



DECAL REPLACEMENT

Plastic polyethylene material must be “flame treated” prior to installing a decal to ensure good adhesion. The flame treating procedure can often be used to reduce or eliminate the whitish stress marks that are sometimes left after a fender or cab is bent, flexed, or damaged.

WARNING

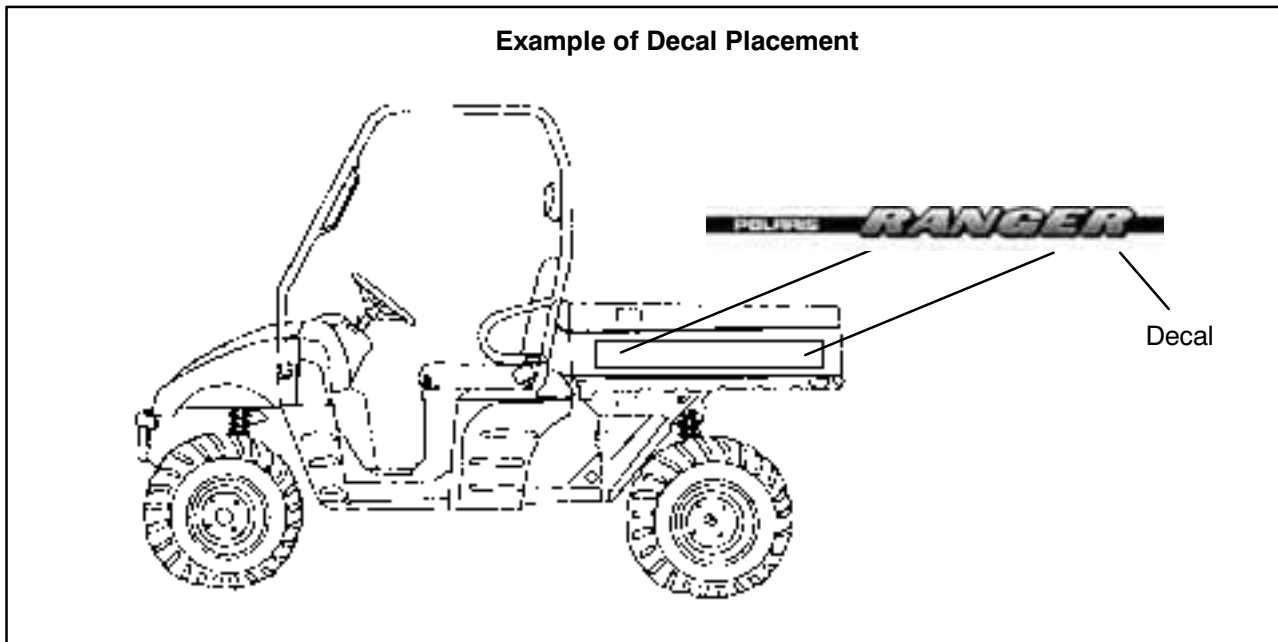
The following procedure involves the use of an open flame. Perform this procedure in a well ventilated

area, away from gasoline or other flammable materials. Be sure the area to be flame treated is clean and free of gasoline or flammable residue.

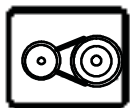
To flame treat the decal area:

1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface. Keep the torch moving to prevent damage.
2. Apply the decal.

Example of Decal Placement



NOTE: Refer to your parts manual for decal part number.



CHAPTER 6

PVT SYSTEM

Service Tools and Supplies	6.2
PVT System Torques	6.2
PVT System Operation Overview	6.2-6.3
PVT Maintenance/Inspection	6.3-6.4
PVT Disassembly	6.5
PVT Assembly	6.6
PVT Sealing and Ducting Components	6.7
Drive Clutch Exploded View	6.7
Drive Clutch Spring Specifications	6.8
Shift Weights	6.9
Drive Clutch Inspection	6.10
Drive Clutch Disassembly/Inspection	6.10-6.12
Drive Clutch Assembly	6.12-6.13
Drive Belt Tension	6.13
Drive Belt Removal/Inspection	6.14-6.15
Drive Belt Installation	6.15
Clutch Alignment /Offset	6.15-6.16
Drive Clutch Bushing Service	6.16-6.18
Driven Clutch Disassembly/Inspection	6.18-6.20
Driven Clutch Assembly	6.20
Driven Clutch Bushing Service	6.20-6.22
Troubleshooting	6.22-6.24





SERVICE TOOLS AND SUPPLIES

TOOL DESCRIPTION	PART NUMBER
Clutch Puller	2870506
Clutch Holding Wrench	9314177
Clutch Holding Fixture	2871358
Spider Nut Socket	2870338
Drive Clutch Spider Removal and Install Tool	2870341
Driven Clutch Puller	2870913
Roller Pin Tool	2870910
Clutch Bushing Replacement Tool Kit	2871226
Piston Pin Puller	2870386
Clutch Compression Tool	8700220
Clutch Bushing Replacement Tool Kit	2871025

SPECIAL SUPPLIES

PART NUMBER

Loctite™ 680 2870584
 RTV Silicone Sealer 2870661
 Loctite Gasket Remover 2870601

PVT SYSTEM FASTENER TORQUES

Drive Clutch Retaining Bolt ... 40 ft. lbs. (54 Nm)
 Driven Clutch Retaining Bolt .. 17 ft. lbs. (23 Nm)
 PVT Inner Cover Bolts 12 ft. lbs. (16 Nm)
 PVT Outer Cover Bolts 45–50 in.lbs (5–5.6 Nm)
 Drive Clutch Spider 200 ft. lbs. (271 Nm)
 Drive Clutch Spider Lock Nut (Plastic) . 15 ft. lbs. .
 (20.3 Nm)
 Drive Clutch Cover Plate 90 in. lbs. (10 Nm)

PVT OPERATION OVERVIEW

⚠ WARNING

All PVT maintenance or repairs should be performed only by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual. **Because of the critical nature and precision balance incorporated into the PVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.**

The Polaris Variable Transmission (PVT) consists of three major assemblies: 1) The Drive Clutch; 2) The Driven Clutch; and 3) The Drive Belt. The internal components of the drive clutch and driven clutch control engagement (initial vehicle movement), clutch upshift and backshift. During the development of a Polaris ATV, the PVT system is matched first to the engine power curve; then to average riding conditions and the vehicle's intended usage. Therefore, modifications or variations of components at random are never recommended. Proper clutch setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

DRIVE CLUTCH OPERATION

Drive clutches primarily sense engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. Whenever engine RPM is increased, centrifugal force is created, causing the shift weights to push against rollers on the moveable sheave, which is held open by coil spring preload. When this force becomes higher than the preload in the spring, the outer sheave moves inward and contacts the drive belt. This motion pinches the drive belt between the spinning sheaves and causes it to rotate, which in turn rotates the driven clutch.

At lower RPM, the drive belt rotates low in the drive clutch sheaves. As engine RPM increases, centrifugal force causes the drive belt to be forced upward on drive clutch sheaves.

DRIVEN CLUTCH OPERATION

Driven clutches primarily sense torque, opening and closing according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance at the transmission input shaft is greater than the load from the drive belt, the drive belt is kept at the outer diameter of the driven clutch sheaves.



DRIVEN CLUTCH OPERATION CONT'D

As engine RPM and horsepower increase, the load from the drive belt increases, resulting in the belt rotating *up* toward the outer diameter of the drive clutch sheaves and *downward* into the sheaves of the driven clutch. This action, which increases the driven clutch speed, is called *upshifting*.

Should the throttle setting remain the same and the vehicle is subjected to a heavier load, the drive belt rotates back *up* toward the outer diameter of the driven clutch and *downward* into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called *backshifting*.

In situations where loads vary (such as uphill and downhill) and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system should hold engine RPM at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect, the PVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the PVT system changes engine load requirements by either upshifting or backshifting.

cover. All connecting air ducts (as well as the inner and outer covers) must be properly sealed to ensure clean air is being used for cooling the PVT system and also to prevent water and other contaminants from entering the PVT area. This is especially critical on units subjected to frequent water forging.

PVT **MAINTENANCE/INSPECTION**

Under normal operation the PVT system will provide years of trouble free operation. Periodic inspection and maintenance is required to keep the system operating at peak performance. The following list of items should be inspected and maintained to ensure maximum performance and service life of PVT components. Refer to the troubleshooting checklist at the end of this chapter for more information.

1. **Belt Tension, Drive to Driven Clutch Offset, Belt Width.** See Pages 6.13-6.19 and 6.21.
2. **Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.** See Pages 6.11-6.12 and 6.15-6.16.
3. **Sheave Faces.** Clean and inspect for wear.
4. **PVT System Sealing.** Refer to appropriate illustration below and on the following pages. The PVT system is air cooled by fins on the drive clutch stationary sheave. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented



PVT OVERHEATING/DIANOSIS

During routine maintenance or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating

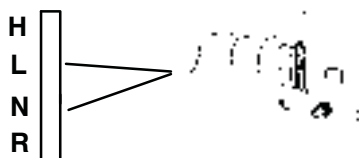
temperatures. The *RANGER* should be operated in D-1 when pulling or plowing heavy loads, or if extended low speed operation is anticipated.

Clutch Drive Belt & Cover Related Issues: Diagnosis	
Possible Causes	Solutions/What to do
Loading the Utility Task Vehicles™ into a truck or tall trailer when in high range.	Shift transmission to Low during loading of the Utility Task Vehicles™ to prevent belt burning
Starting out going up a steep incline from a stopped position.	When starting out on an incline, use Low, or dismount the Utility Task Vehicles™ after first applying the park brake and perform the "K" turn.
Driving at low RPM or low ground speed (at approximately 3-7 MPH).	Drive at higher speed or use Low. The use of Low is highly recommended for cooler PVT operating temperatures and longer component life.
Insufficient warm-up of Utility Task Vehicles™ exposed to low ambient temperatures.	Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.
Slow and easy clutch engagement.	Fast, effective use of the throttle for efficient engagement.
Towing/Pushing at low RPM/low ground speed.	Use Low only.
Plowing snow, dirt, etc./utility use.	Use Low only.
Stuck in mud or snow.	Shift the transmission to Low, carefully use fast, aggressive throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Climbing over large objects from a stopped position.	Shift the transmission to Low, carefully use fast, aggressive, brief throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Belt slippage from water or snow ingestion into the PVT system.	Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to full throttle . Repeat several times as required. During this procedure, the throttle should not be held at the full position for more than 10 seconds. Clutch seals should be inspected for damage if repeated leaking occurs.
Clutch malfunction.	For inspection of clutch components, please contact your Polaris dealer. Shift transmission to Low during loading of the Utility Task Vehicles™ to prevent belt burning.
Poor engine performance.	Fouled plugs, foreign material in gas tank, fuel lines, or carburetor. Contact you dealer for further service information.
GENERAL RANGE OPERATION GUIDELINES:	Low: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, ect.), low ground speeds. High: High ground speeds, speeds above 7 MPH.

Low Is Primary Drive Gear

Low is the primary driving gear for *RANGER*. Low should be used in ALL driving applications except for driving on hard packed level surfaces with light loads. In this circumstance, High may be used. Using High for heavy loads, hilly terrain, or in wet, muddy conditions will increase the chance of drive belt burning.

1. Use Low as the primary driving gear.
2. Use High only on hard packed, level surfaces with light loads.

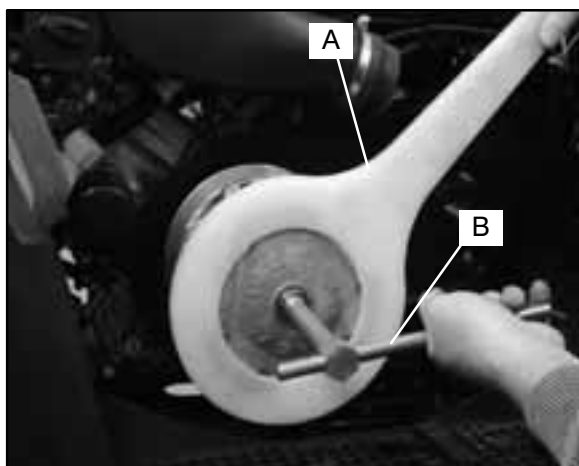




PVT DISASSEMBLY

NOTE: Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement. (See Page 6.7).

1. Remove seat.
2. Remove or loosen rear cab fasteners as necessary to gain access to PVT outer cover.
3. Remove PVT air outlet duct hose.
4. Remove outer cover screws. Refer to Page 6.7.
5. Mark the drive belt direction of rotation and remove drive belt. See Page 6.14 for drive belt removal.



6. Install the Drive Clutch Holder (**PN 9314177**) (A).
7. Remove drive clutch retaining bolt and remove drive clutch using the Drive Clutch Holder (**PN 9314177**) (B).

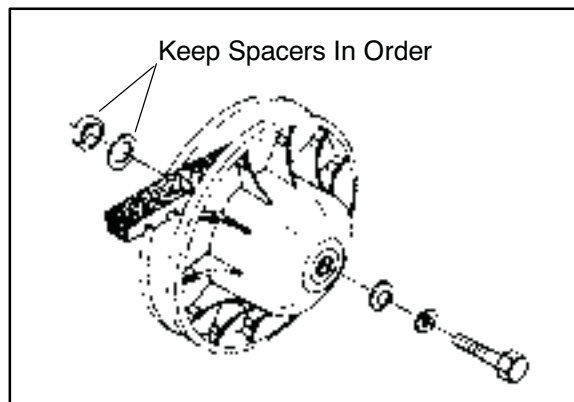
Drive Clutch Puller (PN 2870506)

Drive Clutch Holder (PN 9314177)

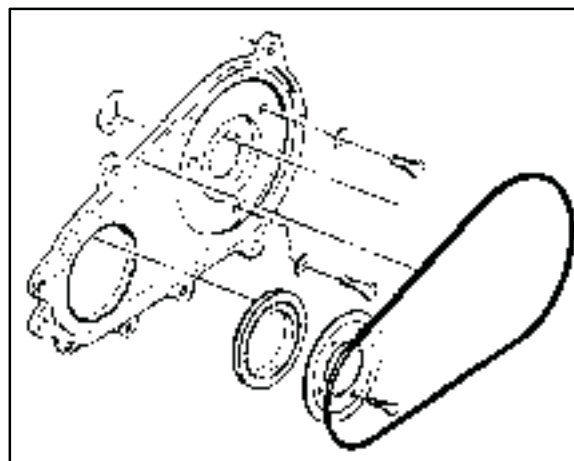


8. Remove driven clutch retaining bolt and driven clutch. Use the Driven Clutch Puller (**PN 2870913**) if necessary.

Driven Clutch Puller (PN 2870913)



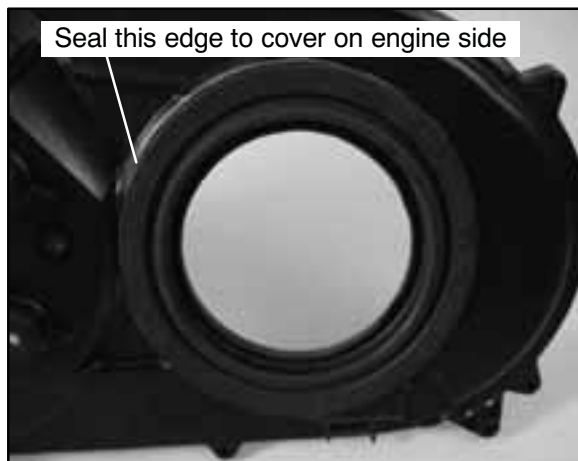
9. Remove driven clutch offset spacers from the transmission input shaft.



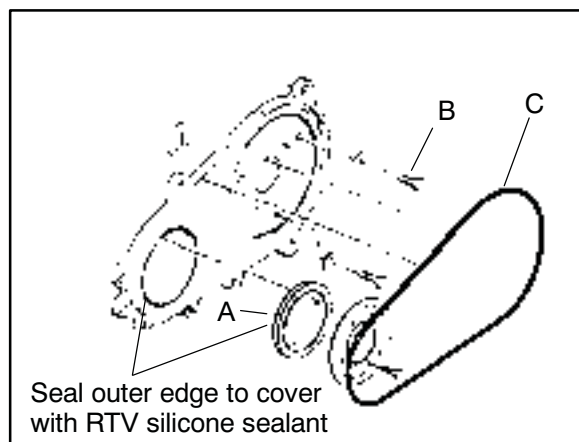
10. Remove screws and retainer plate.
11. Remove inner cover retaining bolts at rear of cover.
12. Remove cover along with foam seal on back of cover or shaft.



PVT ASSEMBLY



1. Inspect PVT inner cover-to-engine seal. Replace if cracked or damaged.
2. Place a new foam seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner cover-to-engine seal, to ensure a water tight fit between the seal and the cover. Surfaces must be clean to ensure adhesion of silicone sealant.
4. Reinstall cover and tighten rear cover bolts just enough to hold it in place.

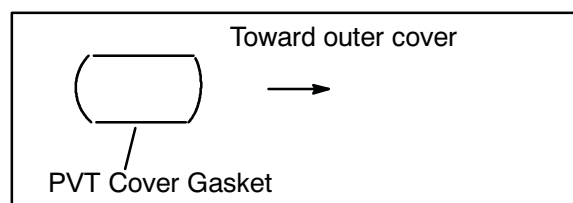


5. Fit lip of inner cover seal (A) to engine. Install seal retainer plate and tighten screws securely.
6. Torque rear inner cover bolts (B) to specification.

Inner Cover Bolt Torque (Rear):
12 ft. lbs. (16.6 Nm)
Outer Cover Bolt Torque:
45-50 in.lbs. (5-5.6 Nm)
Driven Clutch Retaining Bolt Torque:
17 ft. lbs. (23.5 Nm)
Drive Clutch Retaining Bolt Torque:
40 ft. lbs. (55 Nm)



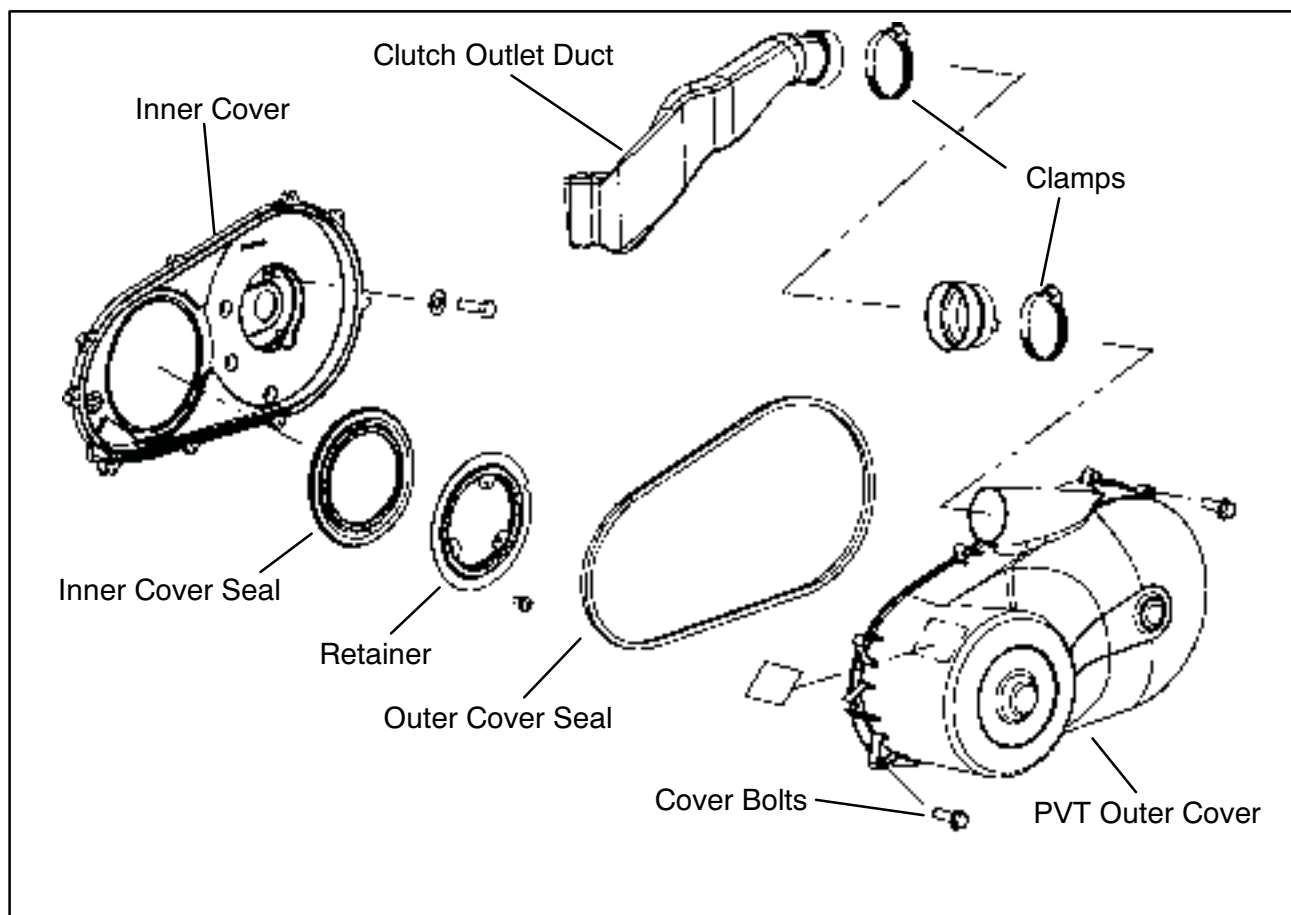
7. Install clutch offset spacers on transmission input shaft.
8. Clean splines inside driven clutch and on the transmission input shaft.
9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.
11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.
13. Reinstall drive belt noting direction of rotation. If a new belt is installed, install so numbers can be easily read.



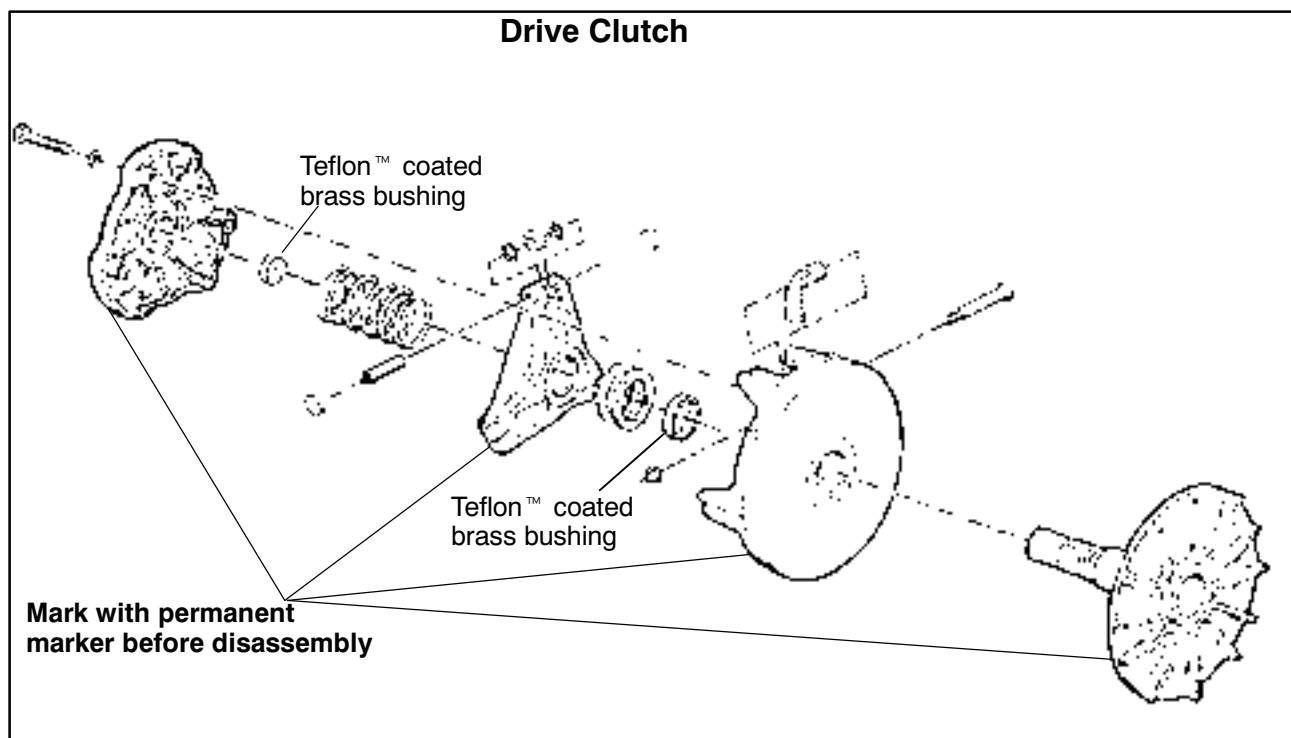
14. Replace PVT outer cover rubber gasket with the narrow side out (C).
15. Reinstall PVT outer cover and secure with screws Torque to 45-50 in. lbs. (5-5.6 Nm).
16. Reinstall rear cab assembly and seat.



PVT SEALING AND DUCTING COMPONENTS



DRIVE CLUTCH EXPLODED VIEW





DRIVE CLUTCH SPRING SPECIFICATIONS

The drive clutch spring has two primary functions:

1. **To control clutch engagement RPM.** The springs which have a higher rate when the clutch is in neutral will increase clutch engagement RPM.
2. **To control the rate at which the drive belt moves upward in the drive clutch sheaves.** This is referred to as drive clutch upshift.

There are other components which control upshift, but the spring is one of the primary components in insuring optimum performance. It is very important that the spring is of the correct design and is in good condition.

CAUTION: Never shim a drive clutch spring to increase its compression rate. This may result in complete stacking of the coils and subsequent clutch cover failure.

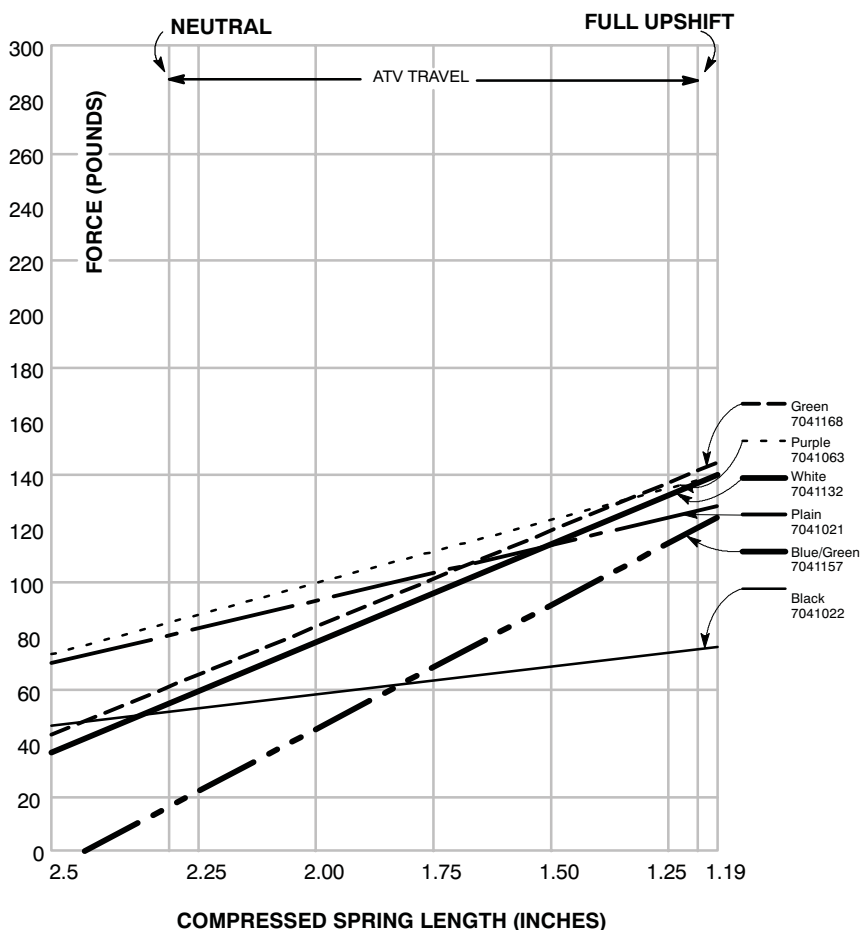
The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe stress the spring is subject to during operation, it should always be inspected for tolerance limits during any clutch operation diagnosis or repair.

With the spring resting on a flat surface, measure its free length from the outer coil surfaces as shown. Refer to the spring specification chart for specific free length measurements and tolerances. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.

Primary Clutch Springs

Secondary Clutch Springs

PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH $\pm .125"$	PART NUMBER	DESCRIPTION
7041021	Plain	.157"	4.38"	7041198	Red
7041022	Black	.140"	4.25"	7041782	Black 5-coil
7041063	Purple	.168"	4.37"	7041501	Gold 6-coil
7041132	White	.177"	2.92"	7041499	Silver
7041168	Green	.177"	3.05"	7041296	Blue
7041157	Blue/Green	.177"	2.53"	7041646	Silver/Blue

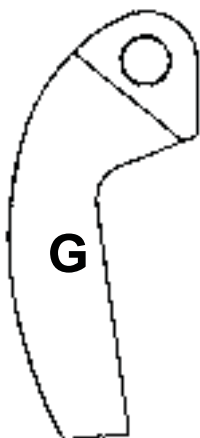




SHIFT WEIGHTS

Shown below are the shift weights which have been designed for, or which may be used in the PVT system. These shift weights have many factors designed into them for controlling engagement RPM

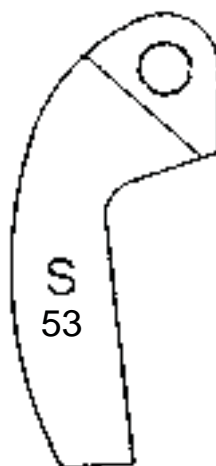
and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding of their positioning and the effects they may have on belt to sheave clearance, clutch balance and shifting pattern.



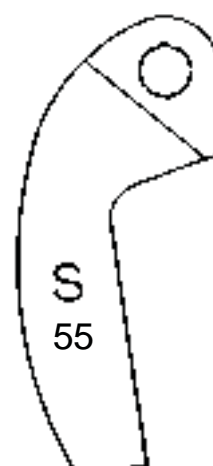
PN 5630514
48 gr



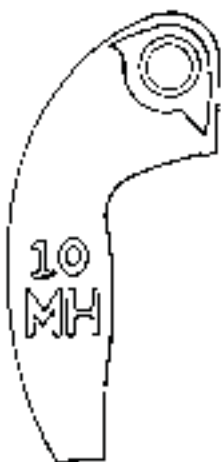
PN 5630515
45 gr



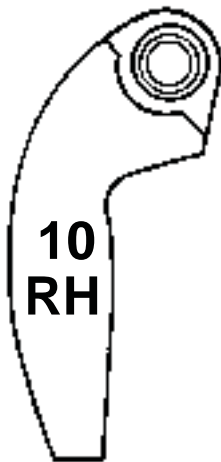
PN 5630095
53 gr



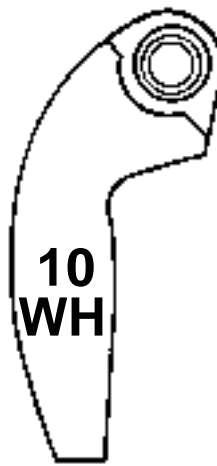
PN 5630509
55 gr



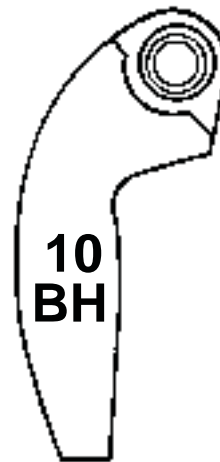
PN 5630513
50.5 gr



PN 5630709
44 gr



PN 5630710
46 gr



PN 5630711
47gr



DRIVE CLUTCH INSPECTION

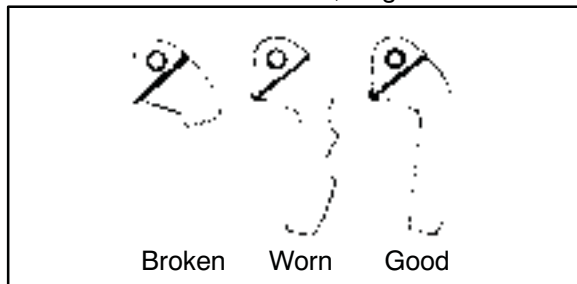
⚠ WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

All PVT system maintenance repairs must be performed only by an authorized Polaris service technician who has attended a Polaris sponsored service training seminar and understands the proper procedures as outlined in this manual. **Because of the critical nature and precision balance incorporated into the PVT system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.**



1. Remove shift weight bolts and weights. Inspect as shown. The contact surface of the weight should be smooth and free of dents or gall marks. Inspect the weight pivot bore and pivot bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts. **NOTE:** A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See "ROLLER, PIN AND THRUST WASHER INSPECTION", Page 6.12.



BUTTON TO TOWER CLEARANCE INSPECTION

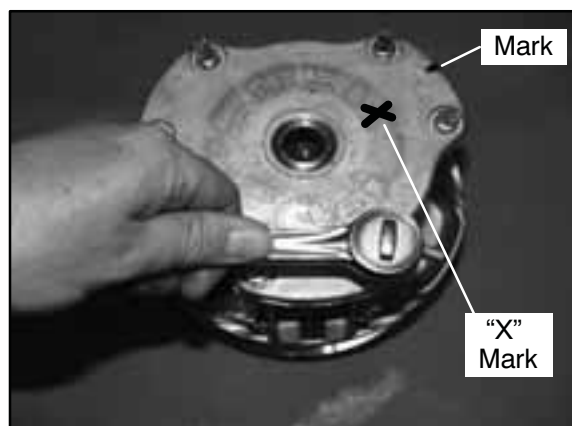
1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See "SPIDER REMOVAL" Page 6.11.



**Button to Tower Clearance:
000 - .001"**

2. Inspect sheave surfaces. Replace the *entire service clutch* if worn, damaged or cracked.

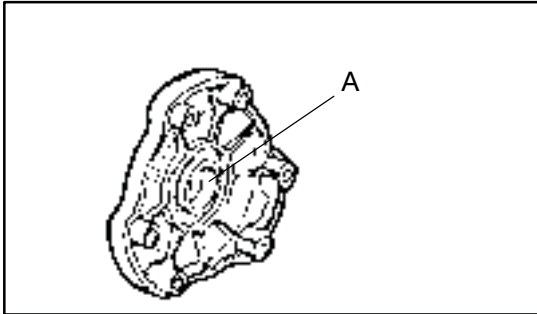
DRIVE CLUTCH DISASSEMBLY



1. Using a permanent marker, mark the cover, spider, moveable and stationary sheaves, and steel post to the stationary sheave for reference. The X's may not have been in alignment before disassembly.



2. Remove cover bolts evenly in a cross pattern, and remove cover plate.

**Cover Bushing Inspection:**

Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

3. Inspect cover bushing (A). The outer cover bushing is manufactured with a Teflon™ coating. Bushing wear is determined by the amount of Teflon™ remaining on the bushing.



4. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.
5. Remove and inspect spring. (See Page 6.8)

SPIDER REMOVAL

Clutch Holding Fixture:
(PN 2871358)

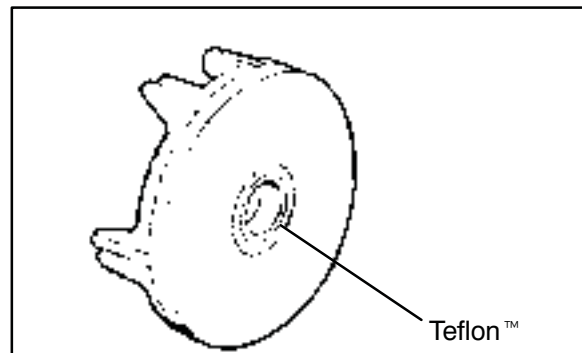
Spider Removal Tool:
(PN 2870341)

1. Install clutch in holding fixture and loosen the spider (counterclockwise) using spider removal tool.

NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. Be sure to note the number and thickness of these washers.

Moveable Sheave Bushing Inspection

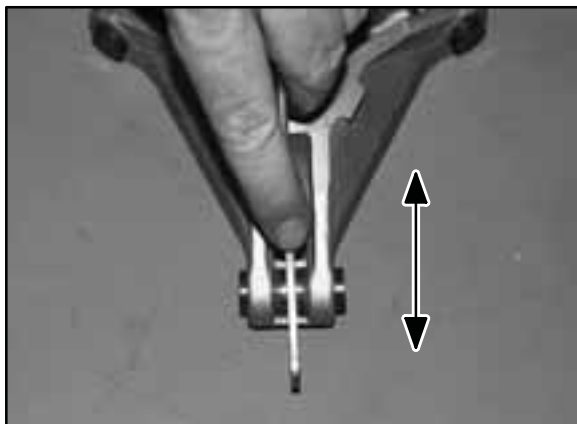
2. Inspect the Teflon™ coating on the moveable sheave bushing.

**Moveable Sheave Bushing Inspection:**

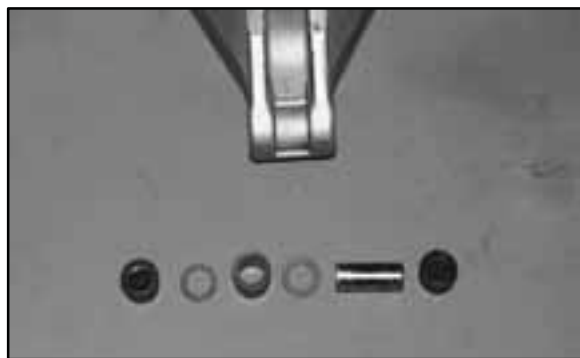
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.



ROLLER, PIN AND THRUST WASHER INSPECTION



1. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace rollers, pins and thrust washers in sets of three. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Use the Roller Pin Tool (PN 2870910) to replace rollers and pins. Take care not to damage roller bushing or bearing surface of the new pin during installation.



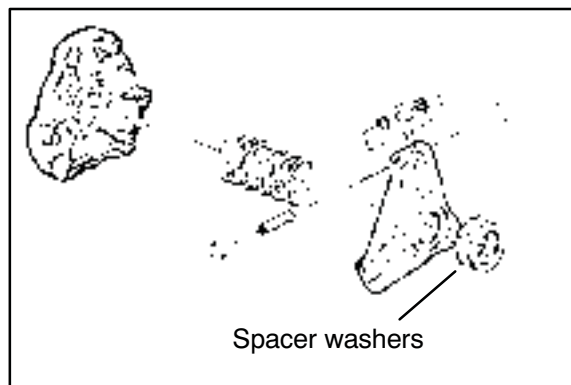
2. Rubber backed buttons can be used in all ATV clutches *if the hollow roller pin is changed to the solid roller pin.* **NOTE:** The rubber side of the button is positioned toward the solid roller pin.

DRIVE CLUTCH ASSEMBLY



NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. The Teflon™ bushings are self-lubricating. **Do not apply oil or grease to the bushings.**

1. Reassemble drive clutch in the following sequence. Be sure the "X", or the marks that were made earlier, are aligned during each phase of assembly)
 - a) "X", or the marks that were made earlier, on cover
 - b) spider, making sure spacer washers are installed underneath spider and positioned properly in recess
 - c) "X", or the marks that were made earlier, under weight



2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. Compress spider buttons for each tower and install spider, making sure that "X", or the marks that were made earlier, on spider aligns with "X", or the marks that were made earlier, in moveable sheave.

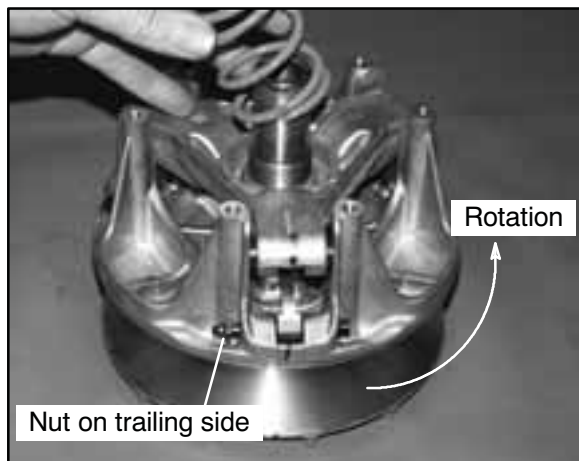




5. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave. Refer to Page 6.2 for torque specification.

CAUTION:

Be sure the spider spacer washers are fully seated in the recessed area in the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.



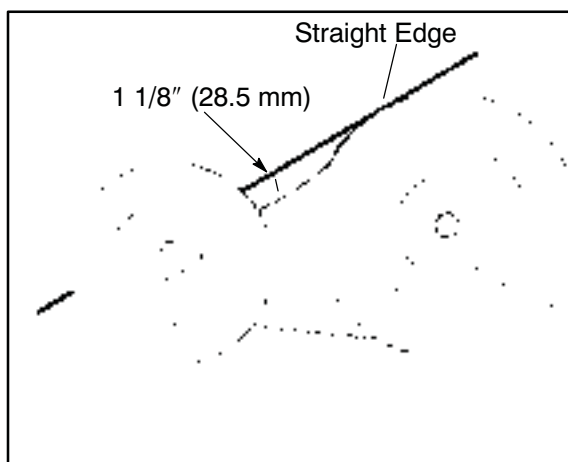
6. Install shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.



Spider Torque:
200 ft. lbs. (276 Nm)

Cover Screw Torque:
90 in. lbs. (10.4 Nm)

8. Reinstall cover, aligning "X" mark with other marks. Torque cover bolts evenly to specification.

DRIVE BELT TENSION**Belt Deflection (Tension):**

1 1/8" (2.9 cm) - 1 1/4" (3.2 cm)

NOTE: Pinch the sheaves lightly together with clamp to prevent the belt from being pushed into the driven sheave.

1. Place a straight edge on top of the belt between drive and driven clutch.
2. Push down on drive belt until it is lightly tensioned.
3. Measure belt deflection as shown in photo.

NOTE: If belt deflection is out of specification, adjust by removing or adding shims between the driven clutch sheaves.

- Remove shims to decrease belt deflection
- Add shims to increase belt deflection

See DRIVEN CLUTCH
DISASSEMBLY/INSPECTION, Pages 6.18 - 6.19.

NOTE: At least one shim must remain between the inner and outer sheave of the driven clutch. If proper belt deflection cannot be obtained, measure drive belt width, length, and center distance of drive and driven clutch, outlined in this section; all have an effect on belt deflection.

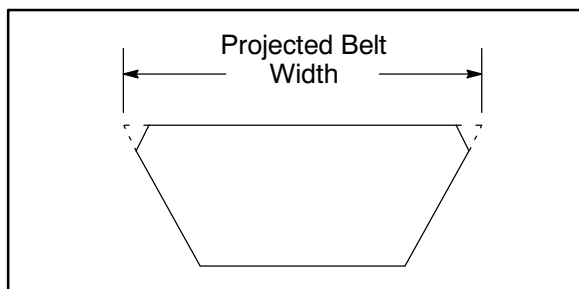


DRIVE BELT REMOVAL/INSPECTION

1. Remove outer PVT cover as described in PVT Disassembly.
2. Mark drive belt direction of rotation so that it can be installed in the same direction. **NOTE:** Normally positioned so part numbers are easily read.



3. To remove drive belt, apply brake, pull upward and rearward on belt to open driven clutch sheaves, pull out and down on belt to slip over the driven clutch outer sheave.

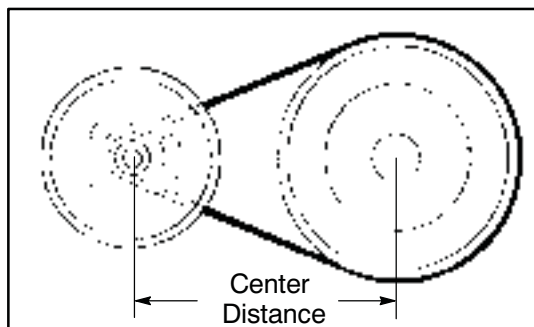


Belt Width:

New 1.174 - 1.188"
(2.98-3.02 cm)

Wear Limit 1.125" (2.86 cm)

4. Measure belt width and replace if worn severely. Generally, belt should be replaced if clutches can no longer be adjusted to provide proper belt deflection.
 - The top edges have been trimmed on some drive belts. It will be necessary to project the side profiles and measure from corner to corner.
 - Place a straight edge on each side of the drive belt.
 - Place another straight edge on top of belt.
 - Measure the distance where the side straight edges intersect the top, as shown in the illustration below.
5. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
6. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt.



Clutch Center Distance -
10" +.1 / -.05 (254 +2.5 / -1.3mm)
Belt Nominal Length - 40.875" ± 3/16
(103.8 cm ± .48 cm)

7. Measure belt length with a tape measure around the outer circumference of the belt. Belts which measure longer than nominal length may require driven shimming or engine adjustment for a longer center distance to obtain proper belt deflection. Belts which measure shorter than nominal length may require driven shimming or a shorter center distance. *Remember, proper belt deflection is the desired goal - not a specific center distance.*



8. Replace belt if worn past the service limit. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See Troubleshooting Chart at the end of this chapter for possible causes. **NOTE:** If a new belt is installed, check belt deflection.

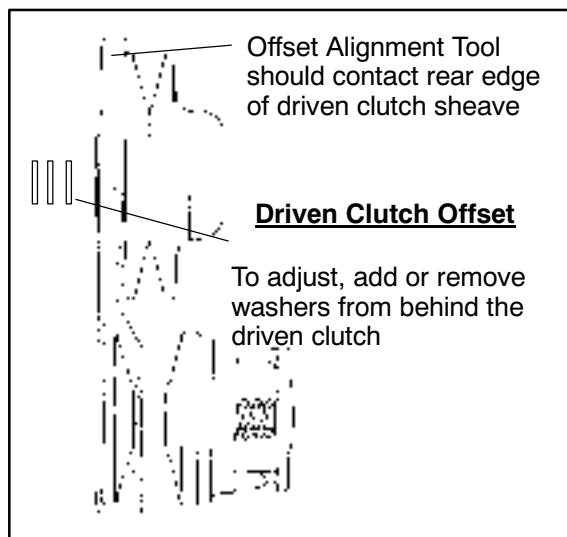
DRIVE BELT INSTALLATION



1. Loop belt over drive and over top of driven sheave.
2. While pushing down on top of belt, turn the back or moveable driven sheave clockwise.
3. The belt then should be able to be pushed down into and between the sheaves.

NOTE: Be sure to position belt so part number is easily read.

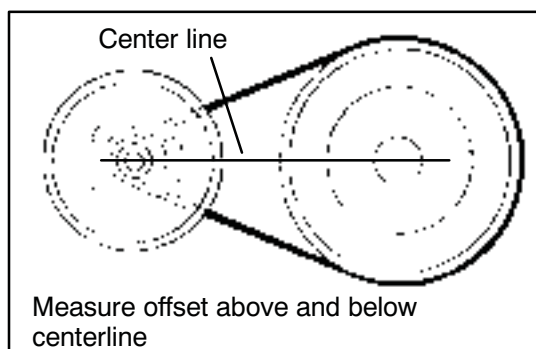
CLUTCH ALIGNMENT



1. Remove belt and install the Clutch Offset Alignment Tool (PN 2870654) as shown.
2. With tool touching rear of driven clutch inner sheave, the distance at point "A" should be $\frac{1}{8}$ ".

If the distance is greater than $\frac{1}{8}$ " or less than $\frac{1}{16}$ ", clutch alignment must be adjusted as follows:

3. Remove drive and driven clutch. See PVT Disassembly, Pages 6.4.
4. Remove PVT inner cover.
5. Loosen all engine mounts. Move front of engine to the right or left slightly until alignment is correct.
6. Tighten engine mounts and verify alignment is correct.



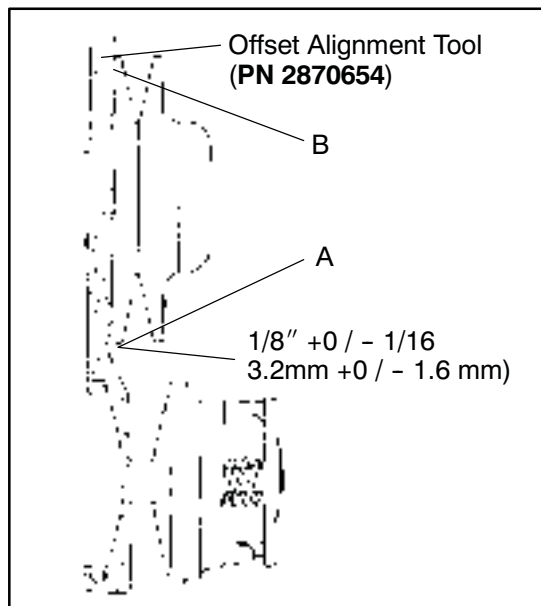
7. Measure belt deflection and measure offset both above and below sheave centerlines. Adjust if necessary.

NOTE: On some models, minor adjustments can be made by adding shims between the frame and front lower left engine mount to increase the distance at point "A". If a shim is present, it can be removed to decrease the distance at point "A".

Shim Kit (PN 2200126)



CLUTCH OFFSET



Important: Inspect clutch alignment and center distance before adjusting offset.

1. Install offset alignment tool as shown.

Offset is correct when rear of tool contacts rear of inner sheave with driven clutch pushed completely inward on shaft and bolt torqued. Adjust offset by adding or removing spacer washers between back of driven clutch and spacer as shown.

Spacer Washer (PN 7556401)

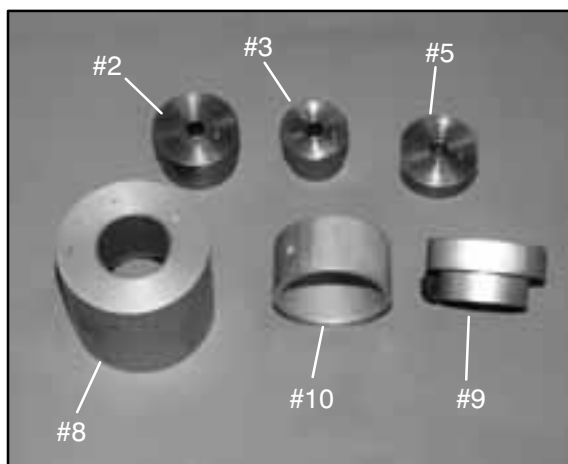
DRIVE CLUTCH BUSHING SERVICE

***Clutch Bushing Replacement Tool Kit (PN 2871226)**

Stamp	Qty.	Part Description	Part #
#2	1	P-90 Drive/Driven Cluth Bushing Install Tool	5020628
#3	1	Drive Clutch Cover Bushing Removal/ Installation Tool (all clutches)	5020629

#5	1	P-90 Driven Clutch Cover Bushing Removal Tool	5020631
#8	1	Main Puller Adapter	5020632
#9	1	Adapter Reducer	5010279
#10	1	Number Two Puller Adapter	5020633

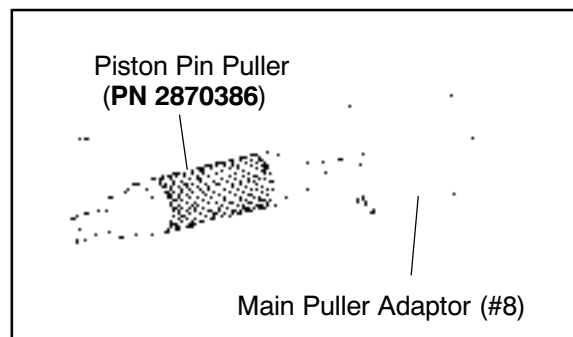
DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL



1. Install handle end of the Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.

Piston Pin Puller (PN 2870386)

2. Remove nut from puller rod and set aside.





3. Install the Main Puller Adapter (#8) (PN 5020632) onto the Piston Pin Puller (PN 2870386).



4. Insert the Number Two Adapter (#10) (PN 5020633) into the bushing from belt side as shown. With towers pointing toward vise, slide sheave and bushing onto puller rod.
5. Install the nut removed in Step 2 onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Nut is left hand thread



6. Turn sheave and puller barrel together counterclockwise on puller rod until bushing is removed.
7. Remove nut from puller rod and set aside.
8. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION

1. Place the Main Puller Adapter (#8) (PN 5020632) onto the puller.
2. Apply Loctite™ 680 (PN 2870584) to the back side of new bushing. Push bushing into center of sheave on tower side by hand.

Bushing (PN 3576504)

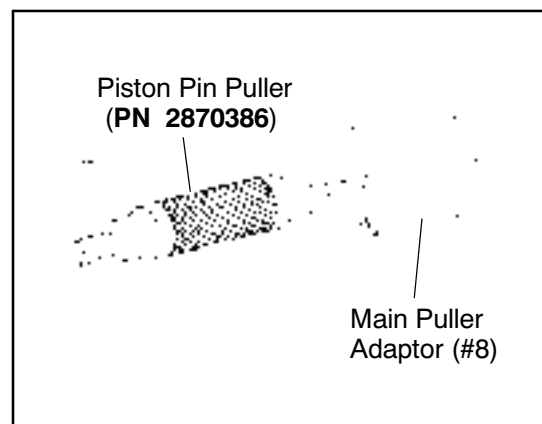
Loctite™ 680 (PN 2870584)

3. Insert the Clutch Bushing Installation Tool (#2) (PN 5020628) into center of sheave and with towers pointing away from vise, slide sheave onto puller rod.
4. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
5. Turn sheave and barrel together counterclockwise until bushing is seated.



6. Remove nut from puller rod and set aside.
7. Remove sheave from puller.
8. Remove installation tool.

DRIVE CLUTCH COVER - BUSHING REMOVAL



1. Install the Main Puller Adapter (#8) (PN 5020632) onto the Piston Pin Puller (PN 2870386).



- From outside of clutch cover, insert the Drive Cover Bushing Remover (#3) (PN 5020629) into cover bushing.



- With inside of cover toward vise, slide cover onto puller.
- Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.



- Turn clutch cover counterclockwise on puller rod until bushing is removed.
- Remove nut from puller rod and set aside.
- Remove bushing and bushing removal tool from puller. Discard bushing.

DRIVE CLUTCH COVER - BUSHING INSTALLATION



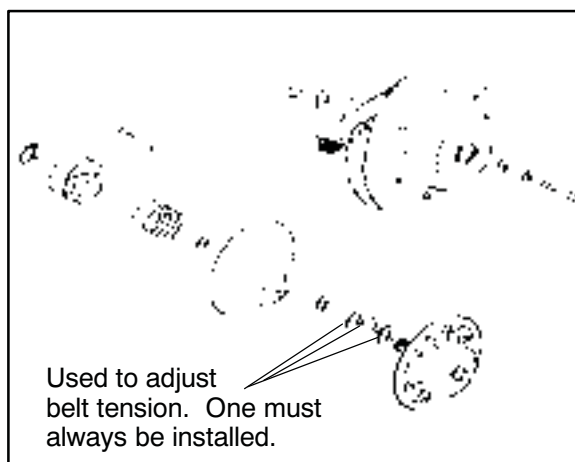
- Apply Loctite™ 680 (PN 2870584) to the back side of new bushing. Working from inside of cover, insert bushing and bushing installation tool into center of clutch cover.



Bushing (PN 3576510)
Loctite™ 680 (PN 2870584)

- With the Main Puller Adapter (#8) (PN 5020632) on the puller, insert cover onto puller rod, placing outside of cover toward vise.
- Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
- Turn clutch cover and barrel together counterclockwise on puller rod until bushing is seated.
- Remove nut from puller rod and take installation tool and clutch cover off rod.

DRIVEN CLUTCH DISASSEMBLY/INSPECTION

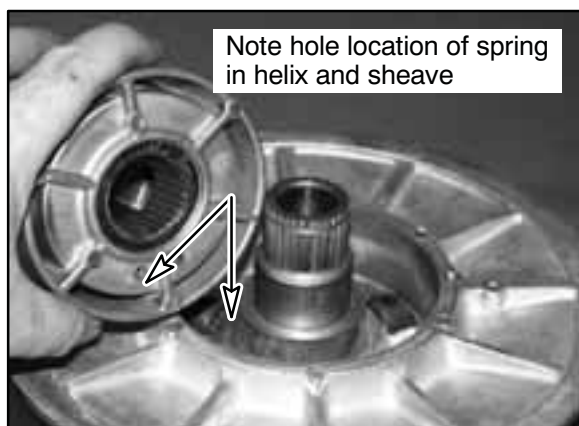


CAUTION:

Wear eye protection when removing snap ring to prevent serious personal injury.



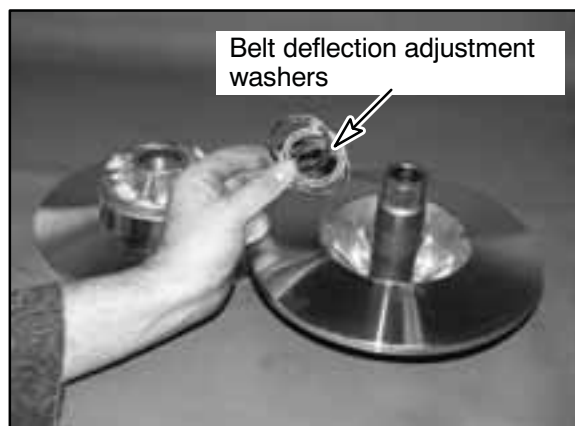
1. Apply and hold downward pressure on the helix, or place driven clutch in the Clutch Compression Tool (PN 8700220).
2. Remove snap ring retainer.



3. Note the location of the spring and remove helix.
4. Note the location of the spring in the moveable sheave, and remove the spring.
5. Check alignment of tabs on spring. Replace the spring if tabs are misaligned or the spring coils are distorted.



6. Inspect ramp buttons in the moveable sheave and replace if worn. **NOTE:** The ramp buttons are secured by Torx™ screws (T20).



7. Remove moveable sheave and note the number of spacer washers. One spacer must remain between the sheaves when adjusting belt deflection.




Moveable Sheave Bushing Inspection:


Replace the bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

8. Inspect the Teflon™ coating on the moveable sheave bushing.
9. Inspect driven clutch faces for wear or damage.
10. Clean and inspect splines on helix and transmission input shaft.
11. Lube splines with a light film of grease. **Do not lubricate the bushings!**



DRIVEN CLUTCH ASSEMBLY



Example:	Helix	Moveable Sheave	Spring Tension
	2 - 1		Heavy
Spring/	2 - 2		
Position	1 - 1		
	2 - 3		
	1 - 2		
	1 - 3		Soft

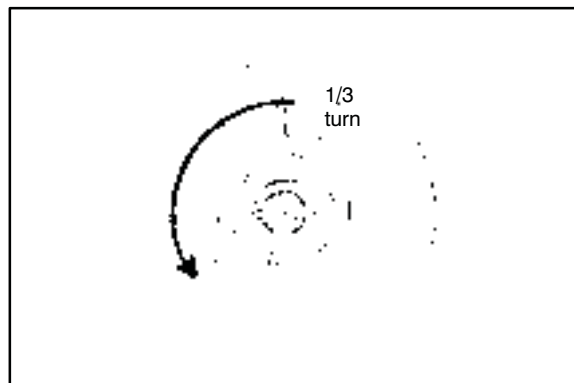
Refer to General Information Chapter 1 for driven clutch spring color and production setting.

1. Install moveable sheave with spacer washers. **Important:** At least one spacer washer must be installed. Teflon™ bushings are self-lubricating. Do not apply oil or grease to the bushings.
2. Install spring, inserting spring tab into proper hole in moveable sheave.
3. Insert spring tab into proper hole in helix. See specifications at the beginning of this section.

The driven clutch, helix/moveable assembly has several different spring locations which affect clutch shifting and RPMs. The greatest amount of spring tension will raise engine RPMs during clutch upshift and allow quicker backshift or downshift when pulling or negotiating a hill, for example. The least amount of tension will create a slower downshift and a harder upshift.



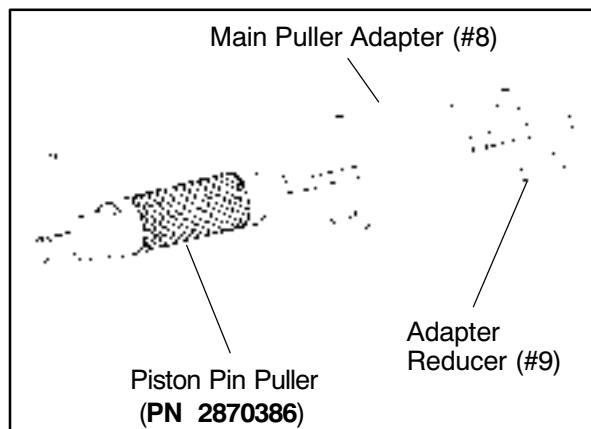
4. Line up boss spline and push helix down until it engages the splines 1/2" to 3/4".



5. While holding downward pressure on helix, wind moveable sheave counterclockwise approximately 1/3 turn (120°).
6. Push helix into place and install snap ring.

DRIVEN CLUTCH BUSHING SERVICE

NOTE: Bushings are installed at the factory using Loctite™. In order to remove the bushing it will be necessary to apply heat. A press can be used to remove and install some of the bushings. Be sure to support the sheave or cover as close as possible to the bushing bore when using a press.



1. Install Main Puller Adapter (#8) (PN 5020632) onto the Piston Pin Puller (PN 2870386).
2. Insert Adapter Reducer (#9) (PN 5010279) onto the puller, sliding it inside the main adapter.



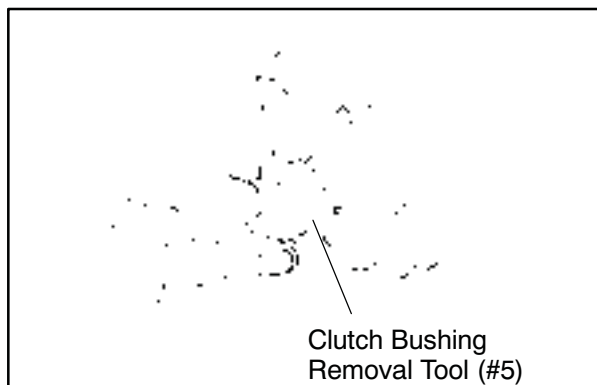
3. Remove ramp buttons from moveable sheave.



4. Using a hand held propane torch, apply heat directly on bushing until tiny smoke tailings appear.

CAUTION:

Clutch components will be hot! In order to avoid serious burns, wear heat resistant insulated gloves for the rest of the removal process.



5. Working from the top, install Driven Clutch Bushing Removal Tool (#5) (PN 5020631) into the center of clutch sheave with smaller diameter toward bushing to be removed. See illustration.

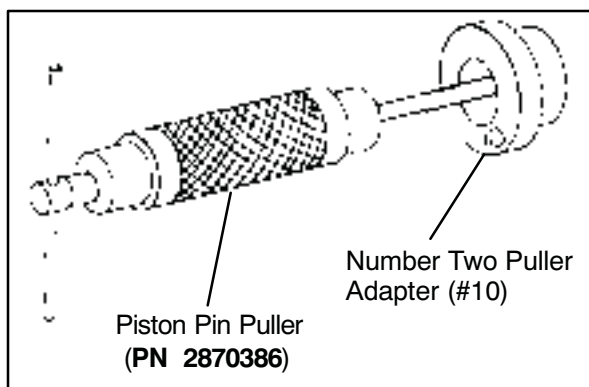


6. Install sheave onto puller.
7. Install nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.



8. Turn clutch sheave counterclockwise until bushing is removed. Repeat Steps 5 - 8 for other bushing.
9. Remove nut from puller rod and set aside.
10. Remove adapters from puller.
11. Remove bushing and removal tool from adapters. Discard bushing.

DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION



1. Working from the top, insert Number Two Puller Adapter (#10) (PN 5020633) onto the puller. See illustration at above.



2. Start new bushing evenly in moveable sheave. Apply Loctite™ 680 (PN 2870584) to the back side of new bushing.



8. Repeat installation procedure for other moveable bushing.

3. Install sheave onto puller with new bushing upward as shown. Install the Number Two Puller Adapter (#10) (PN 5020633).



4. Install nut onto puller rod and hand tighten against installation tool.
5. Turn clutch sheave counterclockwise until bushing is seated.
6. Remove nut from puller rod and set aside.
7. Remove installation tool and clutch sheave from puller.



TROUBLESHOOTING

Situation	Probable Cause	Remedy
Engine RPM below specified operating range, although engine is properly tuned.	<ul style="list-style-type: none">-Wrong or broken drive clutch spring.-Drive clutch shift weight too heavy.-Driven clutch spring broken or installed in wrong helix location.	<ul style="list-style-type: none">-Replace with recommended spring.-Install correct shift weight kit to match engine application.-Replace spring; refer to proper installation location.
Erratic engine operating RPM during acceleration or load variations.	<ul style="list-style-type: none">-Drive clutch binding.-Belt worn unevenly - thin/burnt spots-Driven clutch malfunction.-Sheave face grooved.	<ul style="list-style-type: none">a. Disassemble drive clutch; inspect shift weights for wear and free operation.b. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area.Replace belta. Replace ramp buttons.b. Inspect movable sheave for excessive bushing clearance/replace.-Replace the clutch.
Engine RPM above specified operating range.	<ul style="list-style-type: none">-Incorrect drive clutch spring (too high spring rate).-Drive clutch shift weights incorrect for application (too light).-Drive clutch binding.-Driven clutch binding.-Converter sheaves greasy; belt slippage.	<ul style="list-style-type: none">-Install correct recommended spring.-Install correct recommended shift weights.-Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause.-Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location.-Clean sheaves with denatured alcohol or brake cleaner, install new belt.
Harsh drive clutch engagement.	<ul style="list-style-type: none">-Drive belt worn too narrow.-Excessive belt/sheave clearance with new belt.	<ul style="list-style-type: none">-Replace belt.-Perform belt/sheave clearance adjustment with shim washers beneath spider.
Drive belt turns over	<ul style="list-style-type: none">-Wrong belt for application.-Clutch alignment out of spec.-Engine mount broken or loose.	<ul style="list-style-type: none">-Replace with correct belt.-Adjust alignment offset.-Inspect/adjust or replace.
PVT cover overheating (melting)	<ul style="list-style-type: none">-Plugged air intake or outlet-Belt slippage due to water, oil, grease, etc., rubbing on cover-Clutches or weight being applied to cover while in operation-High vs. low range	<ul style="list-style-type: none">-Clear obstruction.-Inspect system. Clean , repair or replace as necessary. Seal PVT system ducts.-Remove weight. Inform operator.-Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.
Water ingestion	<ul style="list-style-type: none">-Cover seals or ducts leaking-Operator error	<ul style="list-style-type: none">-Find leak and repair as necessary.-Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.

Situation	Probable Cause	Remedy
Belt slippage	<ul style="list-style-type: none"> -Belt worn out -Water ingestion -Belt contaminated with oil or grease 	<ul style="list-style-type: none"> -Replace belt. -Inspect and seal PVT system. -Inspect and clean.
Belt burnt, thin spots	<ul style="list-style-type: none"> -Abuse (continued throttle application when vehicle is stationary, excess load) -Dragging brake -Slow, easy clutch engagement 	<ul style="list-style-type: none"> -Caution operator to operate machine within guidelines. -Vehicle operated with park brake on. Inspect brake system. -Fast, effective use of throttle for efficient engagement.
PVT noise	<ul style="list-style-type: none"> -Belt worn or separated, thin spots, loose belt -Broken or worn clutch components, cover hitting clutches 	<ul style="list-style-type: none"> -Replace belt. -Inspect and repair as necessary.
Engagement erratic or stabby	<ul style="list-style-type: none"> -Thin spots on belt, worn belt -Drive clutch bushings stick 	<ul style="list-style-type: none"> -Replace belt. Refer to belt burnt troubleshooting and instruct operator. -Inspect and repair clutches.

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing. There are no margins, text, or other markings on the page.



CHAPTER 7

FINAL DRIVE

7

Special Tools and Final Drive Torque Specs	7.2
2x4 Front Hub Removal/Inspection	7.2-7.3
2x4 Front Hub Installation	7.3 -7.4
2x4 Front Hub Exploded View	7.4
4X4 & 6x6 Front Hub Removal/Inspection	7.5
4X4 & 6x6 Front Hub Installation	7.5-7.6
4X4 & 6x6 Front Hub Bearing Replacement	7.6-7.7
4X4 7 6x6 Front Hub Exploded View	7.7
4X4 & 6x6 Front Drive Axle Removal/Install	7.8-7.9
Front CV Joint Boot Replacement	7.9-7.11
Front Prop Shaft Removal	7.11-7.12
U-Joint Disassembly / Assembly	7.12-7.13
4X4 & 6x6 Front Gearcase Operation	7.14
4X4 & 6x6 Front Gearcase Removal	7.14-7.15
4X4 & 6x6 Front Gearcase Disassembly	7.15-7.17
4X4 & 6x6 Front Gearcase Assembly	7.17-7.19
4X4 & 6x6 Front Gearcase Installation	7.20
4X4 & 6x6 Front Gearcase Diagnosis	7.20-7.21
4X4 & 6x6 Front Gearcase Exploded View	7.22
6x6 Mid Drive Hub Removal / Install	7.23-7.25
6x6 Mid Drive Hub Disassembly / Assembly	7.25-7.26
6x6 Mid Drive Hub Exploded View	7.27
6x6 Mid Drive Shaft Removal / Installation	7.27-7.29
6x6 Mid Drive Shaft Disassembly / Assembly	7.30
6x6 Mid Gearcase Removal / Installation	7.31, 7.39
6x6 Mid Gearcase Disassembly / Assembly	7.32-7.38
6x6 Mid Gearcase Exploded View	7.40
Rear Hub Inspection	7.41
Rear Axle Housing Removal / Inspection	7.41-7.44
Rear Axle Housing Installation	7.44-7.47
Rear Axle Bearing Removal / Installation	7.47
Rear Differential Removal	7.47
2x4 & 4x4 Rear Differential Disassembly	7.47-7.49
2x4 & 4x4 Rear Differential Assembly	7.49-7.52
2x4 & 4x4 Rear Differential Installation	7.52
2x4 & 4x4 Rear Differential Exploded View	7.53
2x4 & 4x4 Rear Differential Operation	7.54-7.55
2x4 & 4x4 Differential Linkage Inspection/Adj.	7.56-7.57
2x4 & 4x4 Differential Lever Removal / Install	7.57
6x6 Rear Differential Disassembly / Assembly	7.58-7.61
6x6 Rear Differential Installation	7.61
6x6 Rear Differential Exploded View	7.62



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2872608	Roller Pin Removal Tool
8700226	CV Boot Clamp Pliers

WHEEL, HUB, AND SPINDLE TORQUE TABLE

Model	Item	Specification
RANGER 2x4 & 4x4	Front Wheel Nuts	35 Ft. Lbs. (47 Nm)
	Rear Wheel Nuts	35 Ft. Lbs. (47 Nm)
	Front Spindle Nut	40 Ft. Lbs. (55 Nm)
	Rear Hub Retaining Nut	110 Ft. Lbs. (150 Nm)
RANGER 6x6	Front Wheel Nuts	35 Ft. Lbs. (47 Nm)
	Middle Wheel Nut	35 Ft. Lbs. (47 Nm)
	Rear Wheel Nuts	35 Ft. Lbs. (47 Nm)
	Front Spindle Nut	40 Ft. Lbs. (55 Nm)
	Mid Hub Retaining Nut	110 Ft. Lbs. (150 Nm)
	Rear Hub Retaining Nut	110 Ft. Lbs. (150 Nm)

Refer to exploded views and text for torque values of other fasteners

CAUTION: Locking nuts, and bolts with pre-applied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

2X4 FRONT HUB REMOVAL/INSPECTION

1. Elevate front end and safely support machine under footrest / frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping the tire / wheel firmly and checking for movement. Grasp the top and bottom of the tire. The tire should rotate smoothly without binding or rough spots.



3. Remove wheel nuts and wheel.

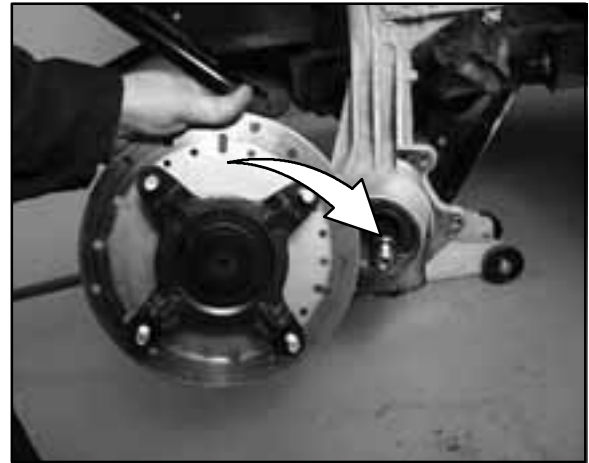
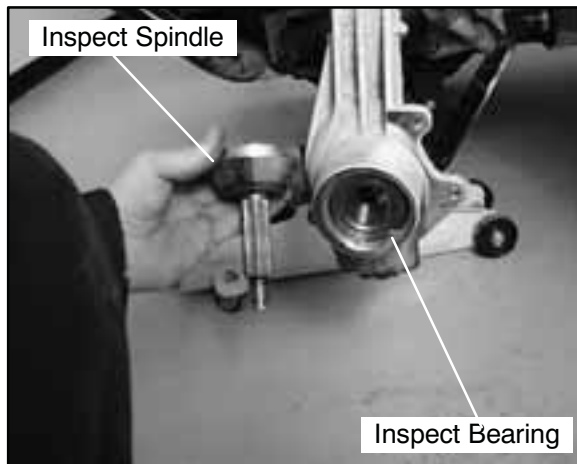
4. Remove the two brake caliper attaching bolts.
CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



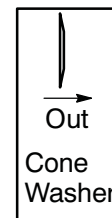
5. Remove hub cap, cotter pin, front spindle nut, and washer.
6. Remove the spindle from the backside of the strut. Rotate each bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion. Replace bearing if moisture, dirt, corrosion, or roughness is evident.



Inspect the spindle splines for wear.

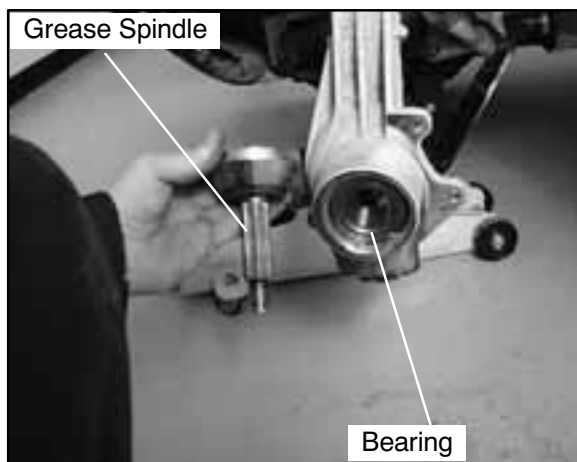


4. Apply grease to washer and install with domed side out.



2X4 FRONT HUB INSTALLATION

1. Inspect the hubstrut bearing surface for wear or damage.
2. Apply grease to spindle.



5. Install spindle nut and tighten to specification.



3. Install spindle through the backside of the hubstrut. Install the hub onto the spindle.

2 x 4 Spindle Nut Torque:

40 ft. lbs. (55.0 Nm)

6. Install a new cotter pin. Tighten nut slightly if necessary to align cotter pin holes.
7. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.
8. Install hub cap.
9. Rotate hub. It should rotate smoothly without binding or rough spots or side play.

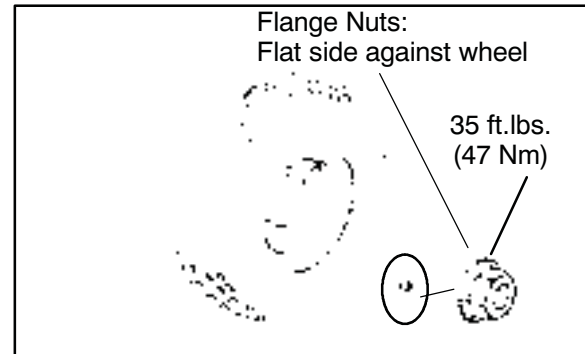


10. Install brake caliper using new bolts. Tighten bolts to specified torque.

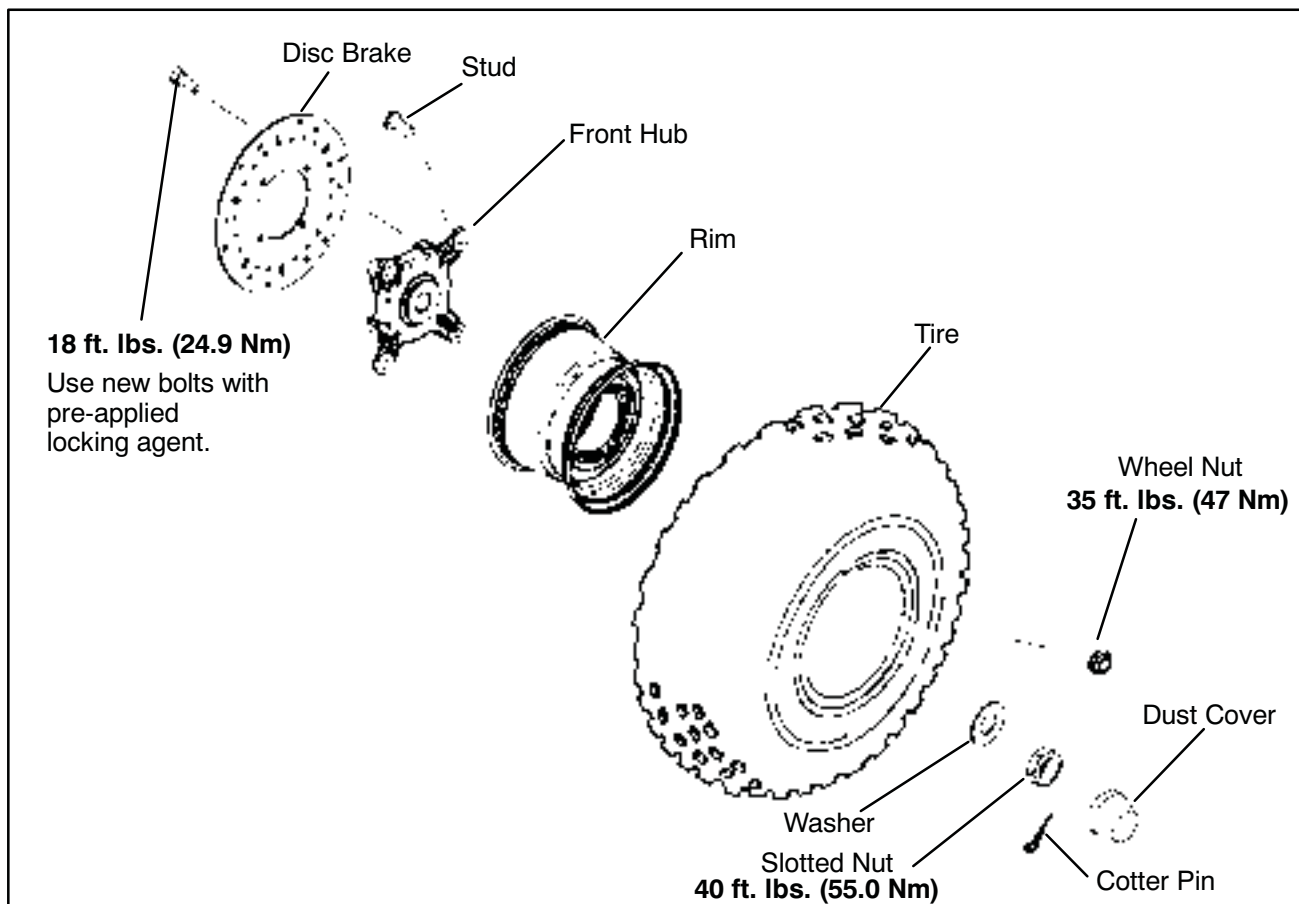
Brake Caliper Bolt Torque**18 ft. lbs. (24 Nm)**

CAUTION: New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

11. Install wheel and wheel nuts and tighten evenly in a cross pattern to 35 ft.lbs. (47 Nm).



2X4 FRONT HUB EXPLODED VIEW



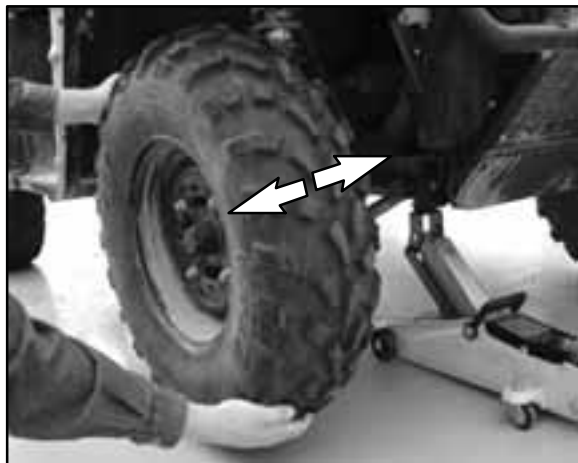


FRONT HUB REMOVAL/INSPECTION (4X4 & 6X6)

1. Elevate front end and safely support machine under footrest / frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping the tire / wheel firmly and checking for movement. Grasp the top and bottom of the tire. The tire should rotate smoothly without binding or rough spots.



3. Remove wheel nuts and wheel.
4. Remove the two brake caliper attaching bolts.
CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



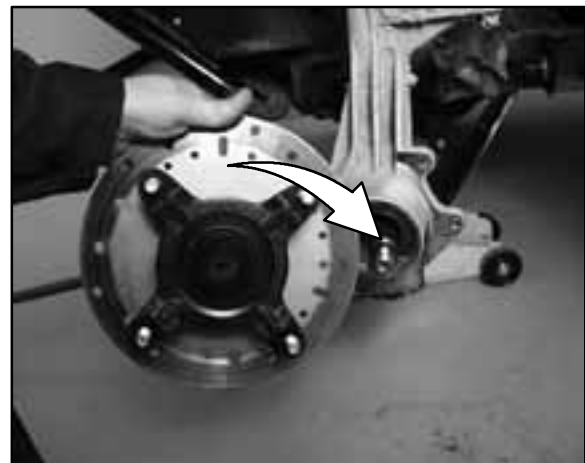
5. Remove hub cap, cotter pin, front spindle nut, and washer.

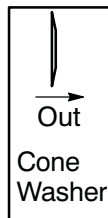


6. Rotate each bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion. Replace bearing if moisture, dirt, corrosion, or roughness is evident.

FRONT HUB INSTALLATION (4X4 & 6X6)

1. Inspect the hubstrut bearing surface for wear or damage.
2. Apply grease to spindle.
3. Install spindle through the backside of the hubstrut. Install the hub onto the spindle.
4. Apply grease to washer and install with domed side out.





5. Install spindle nut and tighten to specification.

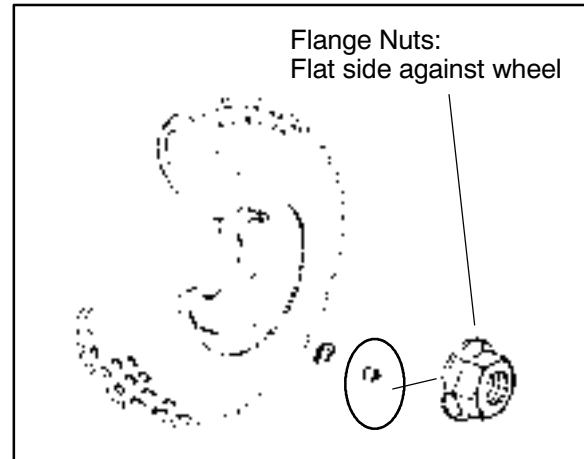


6. Install a new cotter pin. Tighten nut slightly if necessary to align cotter pin holes.
7. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.
8. Install hub cap.
9. Rotate hub. It should rotate smoothly without binding or rough spots or side play.
10. Install brake caliper using new bolts. Tighten bolts to specified torque.

Brake Caliper Bolt Torque
18 ft. lbs. (24 Nm)

CAUTION: New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

11. Install wheel and wheel nuts and tighten evenly in a cross pattern to specified torque.



Front Wheel Nut Torque

35 ft. lbs. (47 Nm)

FRONT HUB BEARING REPLACEMENT (4X4 & 6X6)

1. Remove outer snap ring.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.
3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting,



support casting on outer edges so bearing can be removed.

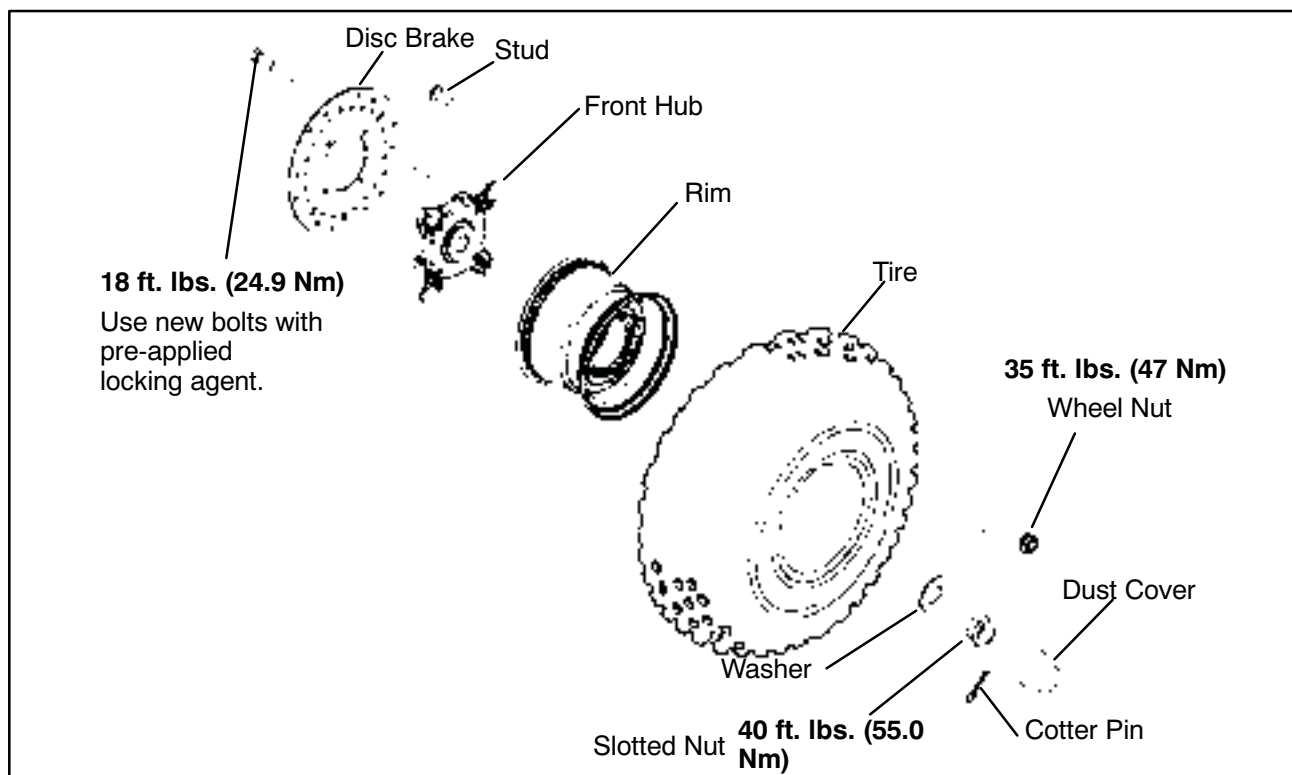


4. Inspect bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

5. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

FRONT HUB EXPLODED VIEW (4X4 & 6X6)



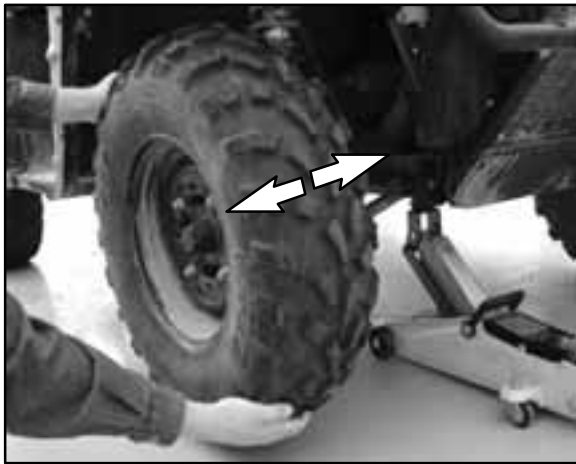


FRONT DRIVE AXLE REMOVAL (4X4 & 6X6)

1. Elevate front end and safely support machine under footrest / frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping tire / wheel firmly and checking for movement. It should rotate smoothly without binding or rough spots.



3. Remove wheel nuts and wheel.
4. Remove the two brake caliper attaching bolts.
CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



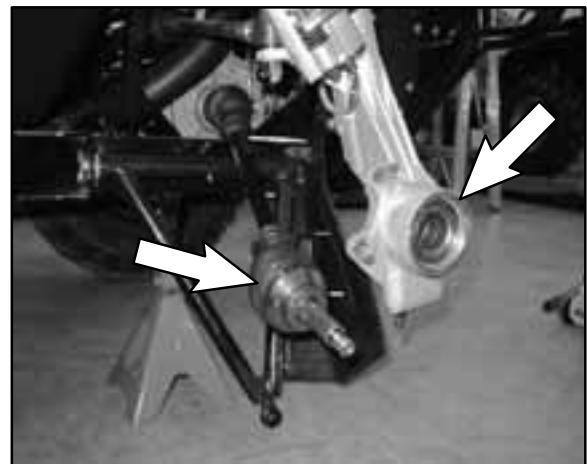
CAUTION:

Serious injury could occur if machine tips or falls.

5. Remove wheel.
6. Remove hub.



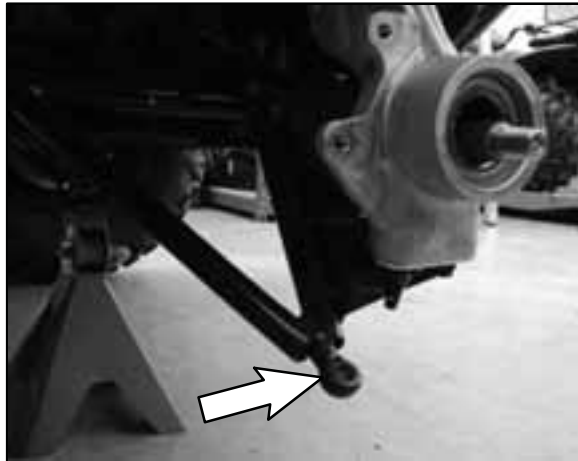
7. Remove cotter pin and nut from lower A-arm ball joint. Remove lower A-arm from ball joint.



8. Pull strut assembly out while pivoting front drive shaft downward until it clears strut assembly.

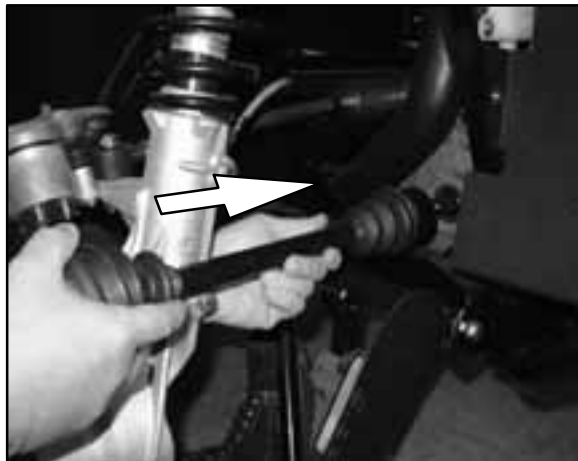


9. With short sharp jerks, remove drive shaft from front gearcase.



FRONT DRIVE AXLE INSTALLATION (4X4 & 6X6)

1. Install new spring ring on drive shaft. Apply an anti-seize compound to splines. Align splines of drive shaft with front gearcase and install by lightly tapping on drive shaft with rubber faced hammer.



2. Install drive shaft in strut.
3. Install lower ball joint, torque nut to 25 ft. lbs. (34.5 Nm) and install new cotter pin.

4. Install hub and tighten spindle nut to 40 ft. lbs. (55 Nm).

Front Spindle Nut Torque

40 ft. lbs. (55 Nm)

DRIVESHAFT AND CV JOINT HANDLING TIPS

Care should be exercised during driveshaft removal or when servicing CV joints. Driveshaft components are precision parts. Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

- The complete driveshaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the driveshaft joints.
- Over-angling of joints beyond their capacity could result in boot or joint damage.
- Make sure surface-ground areas and splines of shaft are protected during handling to avoid damage.
- Do not allow boots to come into contact with sharp edges or hot engine and exhaust components.
- The driveshaft is not to be used as a lever arm to position other suspension components.
- Never use a hammer or sharp tools to remove or to install boot clamps.
- Be sure joints are thoroughly clean and that the proper amount and type of grease is used to refill when joint boots are replaced and when joints are cleaned. Refer to text for grease capacity of CV joints and CV joint boots.



FRONT DRIVE SHAFT CV JOINT BOOT REPLACEMENT

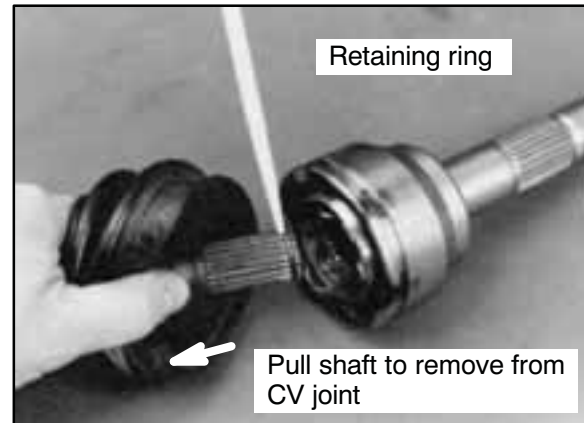
1. Remove wheel, brake caliper and wheel hub. Refer to front hub disassembly Page 7.5 for procedure.
2. Remove cotter pin and castle nut from A-arm ball joint.



3. Disconnect A-arm from ball joint using a tie rod fork.



4. Slide strut off end of drive shaft and tie it up out of the way of the shaft.
5. Remove clamps from rubber boot using the proper boot clamp pliers.



6. Remove the large end of the boot from the CV joint, slide the boot back and separate the wheel spindle and CV joint assembly from the axle shaft by pulling the shaft sharply outward, away from the CV joint. It may be necessary to tap the CV joint assembly outward with a soft faced hammer.
7. Remove small clamp and boot from driveshaft.

If the ATV has been operated with a damaged boot, the CV joint grease may be contaminated. Inspect the grease carefully for contamination, and clean the joint thoroughly if necessary. Front drive axle CV boot replacement requires 30g of grease. If CV joint is cleaned, an additional 30g of grease is required. Refer to information below.

8. Before installing the new boot, remove all grease from the boot area and shaft.

NOTE: It is very important to use the correct type and quantity of grease by using the grease contained in the boot kit. **DO NOT** use a substitute grease and **DO NOT** overfill or underfill the CV joint.

9. Slide the new clamp and boot (small end first) over the splined shaft, then slide (tap) the CV joint into the splines of the axle. Install small boot clamp.
10. Add grease through large end of boot.
11. Position large end of boot on CV joint, purge excess air by partially compressing axle into CV bell, lift one edge of boot to let out excess air. Secure the CV boot with



clamp.

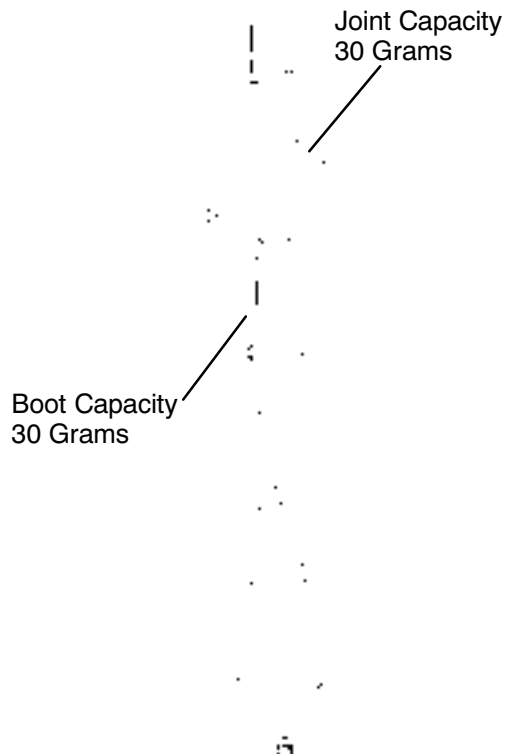
CV Joint Grease - 30g PN 1350046

**CV Boot Clamp Pliers:
Earless Type 8700226**

Boot Replacement requires 30g

**Boot replacement with complete CV
joint cleaning requires an additional
30g. (Total 60g)**

FRONT SHAFT (4x4 & 6x6)



**Front outboard joint capacity: 30g if boot
is replaced only. Another 30g (60g total) if
joint is cleaned.**

FRONT PROP SHAFT REMOVAL (4X4 & 6X6)

1. Elevate front end and safely support machine under footrest / frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

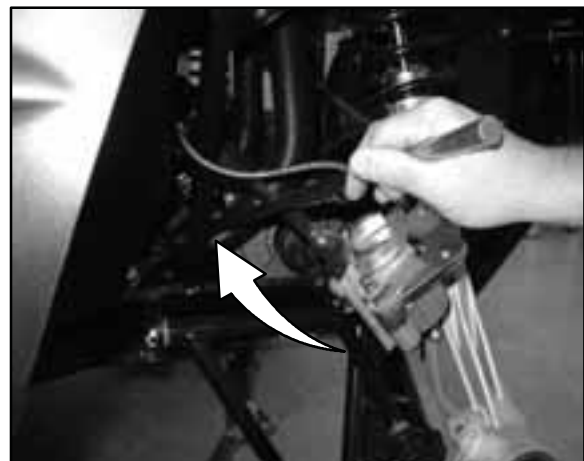
2. Remove wheel nuts and wheel.

3. Remove cotter pin and nut from lower A-arm ball joint. Remove lower A-arm from ball joint. (See below)



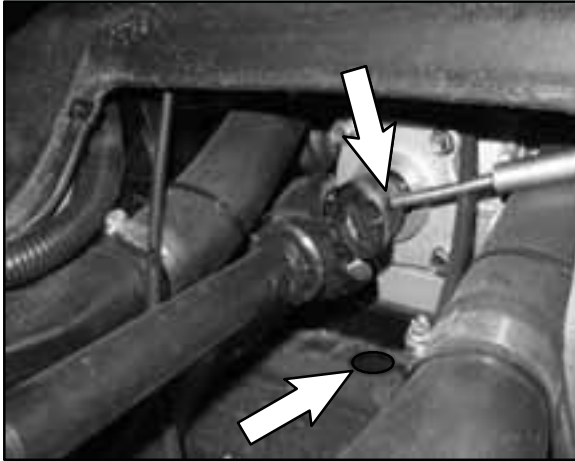
4. Use the Roll Pin Removal Tool (**PN 2872608**), to remove the roll pin from prop shaft at rear of housing. Slide prop shaft back and away from front housing. Pull sharply forward to remove from transmission shaft.

NOTE: The roll pin can also be accessed through the hole in the skid plate shown in the photo below.



**Roll Pin Removal Tool (PN 2872608)**

NOTE: Remove the drive shaft floor cover to help align the roll pin removal tool to the roll pin for removal. The drive shaft can be removed through the floor covering.



2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.

**U-JOINT DISASSEMBLY**

CAUTION: Always wear eye protection.

1. Remove internal or external snap ring from all bearing caps.

NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct re-positioning during installation.

3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.



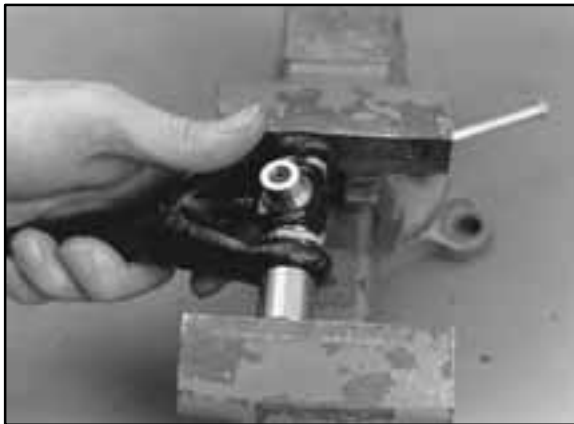


4. Force U-joint cross to one side and lift out of inner yoke.

U-JOINT ASSEMBLY



1. Install new bearing caps in yoke by hand. Carefully install U-joint cross with grease fitting properly positioned inward toward center of shaft. Take care not to dislodge needle bearings upon installation of cross joint. Tighten vise to force bearing caps in.



2. Using a suitable arbor, fully seat bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.
3. Install snap ring to contain bearing cap just installed. Repeat procedure for other side.



4. Install outer yoke, aligning marks made before disassembly.
5. Repeat Steps 1-3 to install bearing caps on outer yoke.

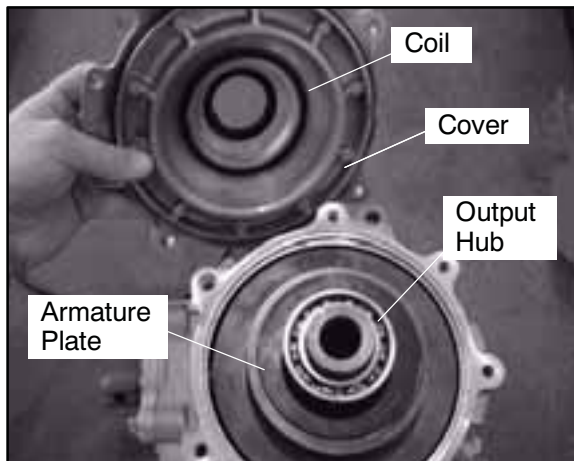


6. Seat all bearing caps against snap rings by supporting cross shaft and tapping on each corner as shown.
7. When installation is complete, yokes must pivot freely in all directions without binding. If the joint is stiff or binding, tap the yoke lightly to center the joint until it pivots freely in all directions.



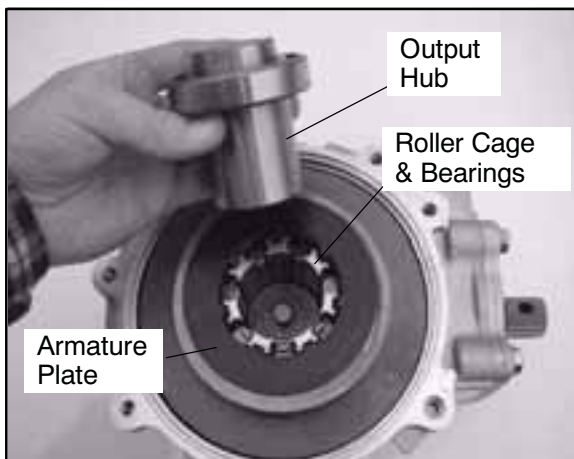
FRONT GEARCASE **OPERATION FOR (4X4 & 6X6** **- CENTRALIZED HILLIARD)**

Normal Operation: With the AWD switch off the vehicle is only driving the rear wheels (2 wheel drive). When the AWD switch is activated it engages the Hilliard and locks both front wheels and we then have, True All Wheel Drive.



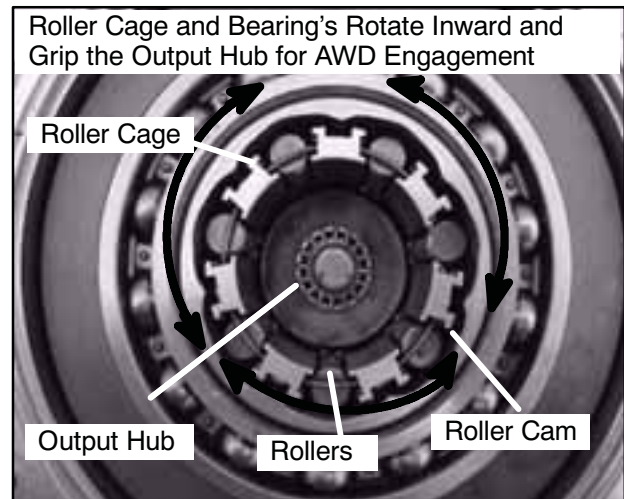
Engagement: When the AWD switch is activated it charges the coil. It then charges an armature plate that is keyed to a roller cage that contains 14 rollers which are forced in by an external cam. The 14 rollers engage themselves to the output hubs that link both front axles. The vehicle now has True All Wheel Drive.

CAUTION: If the rear wheels are spinning, release the throttle before turning the AWD switch on. If AWD is engaged while the wheels are spinning, severe drive shaft and clutch damage could result.



Disengagement: As soon as the front and rear wheels gain traction and are rotating at very close to

the same speed the front wheels will overdrive the output hubs and the rollers are forced outward, disengaging AWD. The vehicle is now back to rear wheel drive.



FRONT GEARCASE **REMOVAL (4X4 & 6X6)**

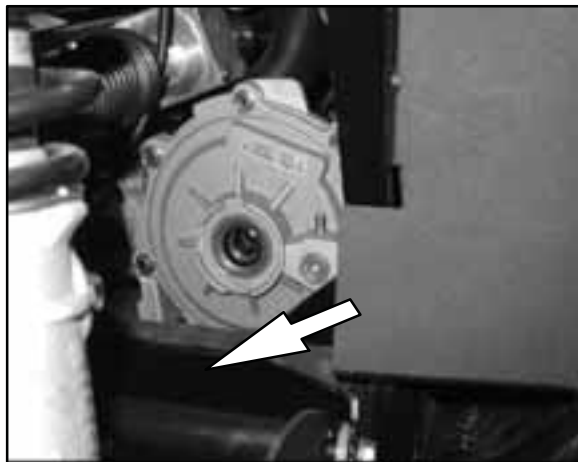
1. Stop engine, place machine in gear and set parking brake.
2. Loosen right front wheel nuts slightly.
3. Elevate and support machine under footrest/frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing and installing bearings and seals.

4. Remove right wheel nuts and wheel.
5. Remove cotter pin, lower ball joint nut, and A-arm from ball joint.



6. Repeat Step 1 through Step 5 on the opposite side.
7. Pull each axle out from the front gearcase.
8. Remove the roll pin from the front drive shaft. Remove the front drive shaft from the front gearcase splines.
9. Remove bolts securing bottom of gearcase to frame. Remove vent line. Remove gearcase from right side of frame. (See photo)



FRONT GEARCASE DISASSEMBLY/INSPECTION (4X4 & 6X6)

1. Drain and properly dispose of used oil. Remove any metal particles from the drain plug magnet.
2. Remove bolts and output shaft cover.

Gearcase Coil Resistance

NOTE: To test the gearcase coils resistance, use the coil harness. The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.



**Front Gearcase Coil Resistance:
22.8-25.2 Ohms**

3. Remove output shaft assembly.

NOTE: Be careful not to misplace the thrust bearing located between the two output shafts.

4. Clean all parts and inspect spacers for wear. Inspect ring gear for chipped, broken, or missing teeth.

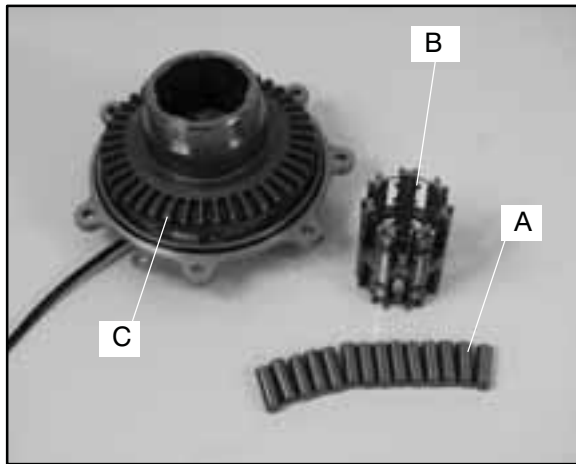




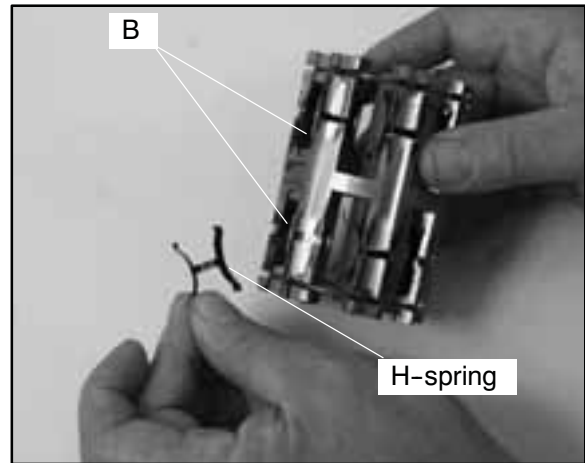
5. Remove the roll cage assembly, rollers, and H-springs.



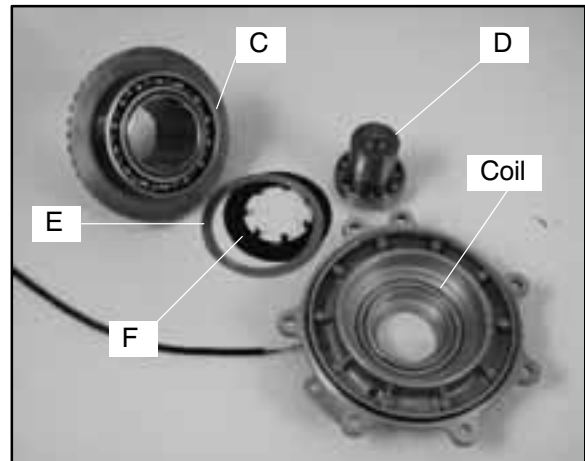
6. Thoroughly clean all parts. Inspect the rollers (A) for nicks and scratches. The rollers must slide up and down freely within the roll cage sliding surfaces (B).
7. Inspect the ring gear (C) for consistent wear patterns. The surfaces should be free of nicks and scratches.



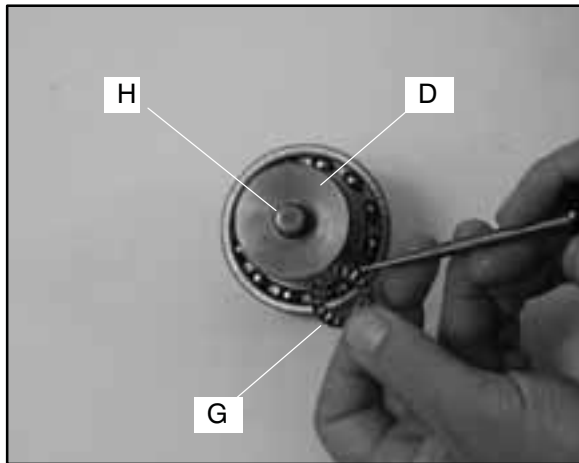
8. Inspect roll cage (B) sliding surface. This surface must be clean and free of nicks, burrs or scratches. Remove and inspect the H-springs.



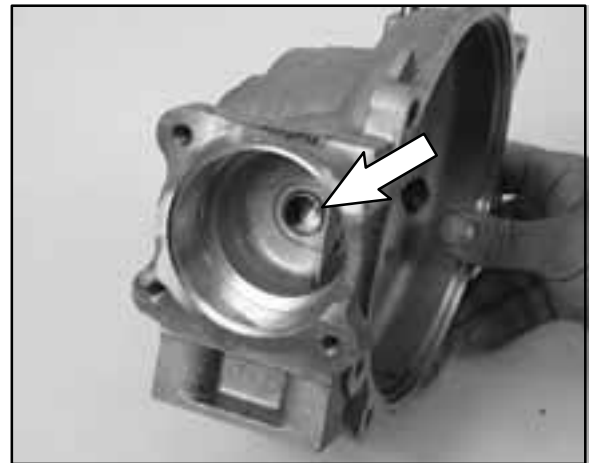
9. Remove the ring gear (C), the output hub (D), the shim (E), and the armature plate (F) from the output cover.
10. Inspect the armature plate (F) for a consistent wear pattern. Uneven wear of the armature plate (F) indicates a warped plate, which may cause intermittent operation.



11. Remove the thrust bearing (G) from the output hub (D). Inspect the thrust bearing (G) and the dowel (H).



12. Remove the other output hub from the main gearcase.

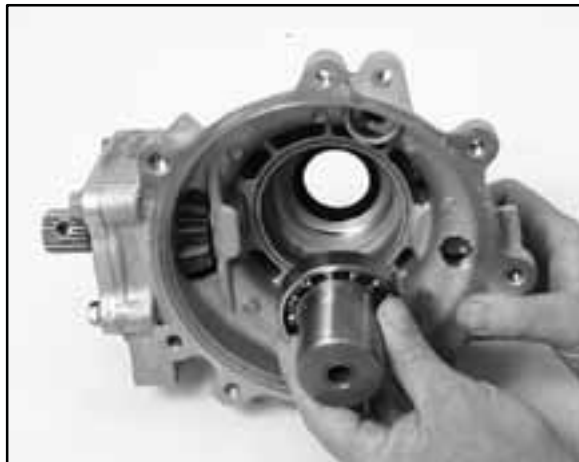


FRONT GEARCASE ASSEMBLY/INSPECTION (4X4 & 6X6)

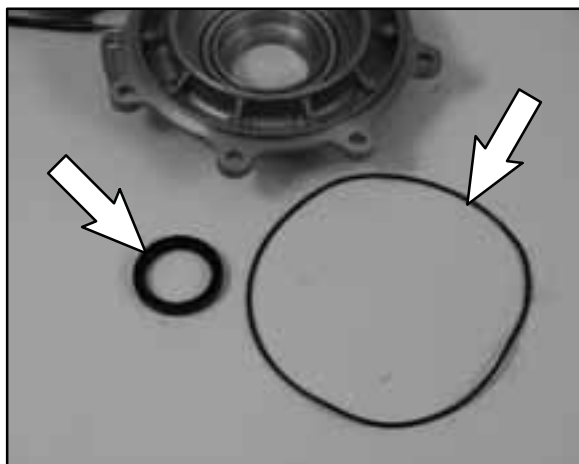
1. Replace all O-rings, seals, and worn components.
2. Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
3. Inspect bearings on output and pinion shafts. To replace, press new bearing on to shaft.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

4. Install pinion shaft, bearing, and input cover with new o-ring and torque bolts to 14 ft. lbs (19 Nm).



13. Remove the O-ring and seal from the output cover.



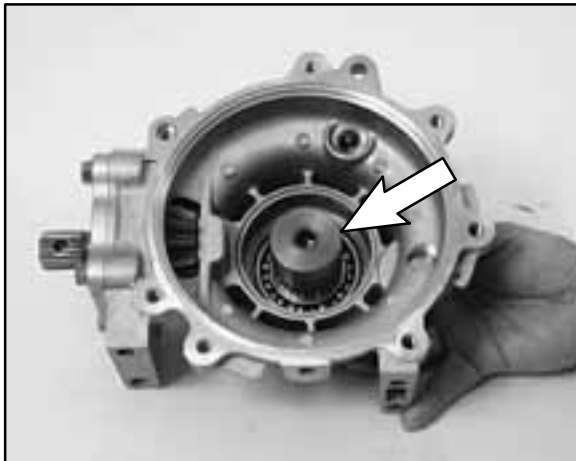
14. Remove the input cover, bearing, and the pinion gear. Inspect the pinion gear for chipped, broken, or missing teeth. Inspect the output shaft bushing. Replace as needed. Clean the inside surfaces of both gearcase halves.



Cover Bolts Torque

14 ft. lbs. (19 Nm)

5. Install the output hub into the gearcase housing. The output hub should spin freely.



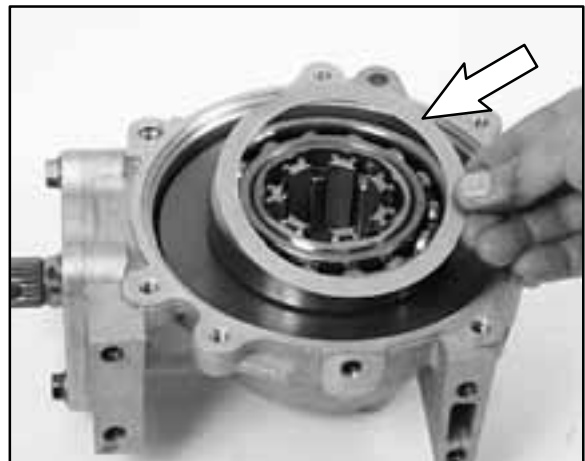
6. Install the ring gear into the gearcase housing.



7. Slide the roll cage into the ring gear. Insert the rollers as the roll cage is installed.

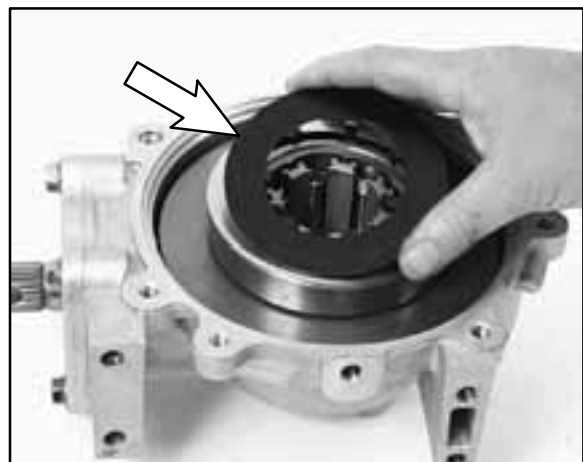


8. Install the shim onto the ring gear.

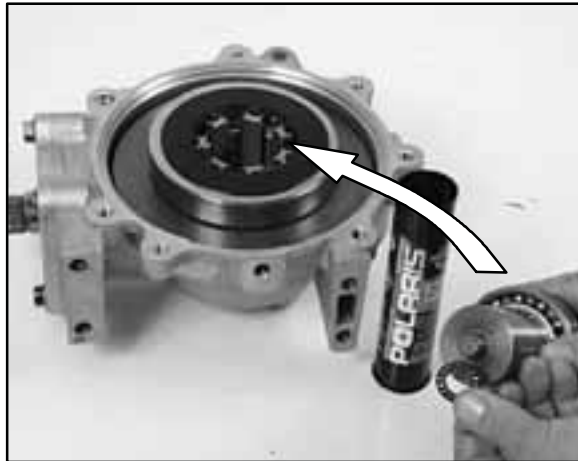


9. Install the armature plate onto the ring gear.

NOTE: Be sure armature plate tabs are placed into the slots on roll cage.



10. Apply grease to the thrust bearing. Insert the thrust bearing onto the output hub. Insert the output hub, dowel, and thrust bearing into the ring gear.



11. Install output cover with new o-ring and torque bolts to 14 ft. lbs. (19 Nm).



13. Install the drain plug and torque the drain plug to 14 ft.lbs. (19 Nm).
14. Set the gearcase on a level surface. Remove the fill plug and fill the gearcase with 5 oz. (150 ml.) of Premium Drive Hub Fluid (PN 2871654). Torque the fill plug to 14 ft. lbs. (19 Nm).

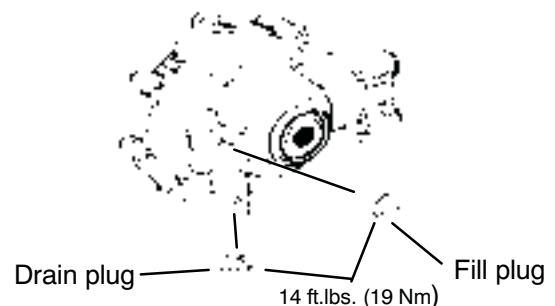


Cover Bolts Torque

14 ft. lbs. (19 Nm)

12. Install new seals into the gearcase housing and gearcase housing cover.

FRONT GEARCASE 4X4

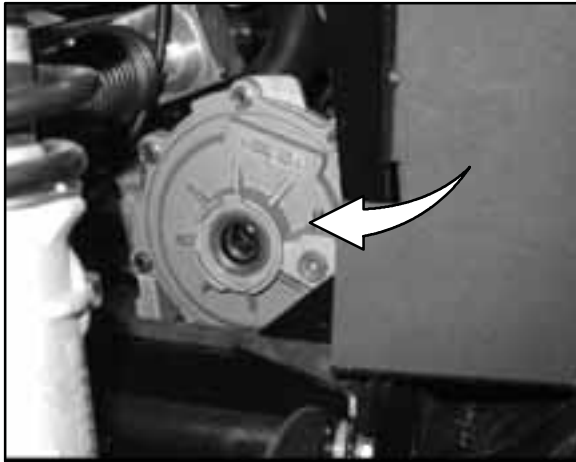


Premium Demand Drive Hub Fluid
(PN 2871654)



FRONT GEARCASE INSTALLATION (4X4 & 6X6)

1. To install gearcase, reverse removal procedure.
2. Make sure the vent opening and vent tube are unobstructed. Install the vent line.



FRONT GEARCASE DIAGNOSIS (4X4 & 6X6)

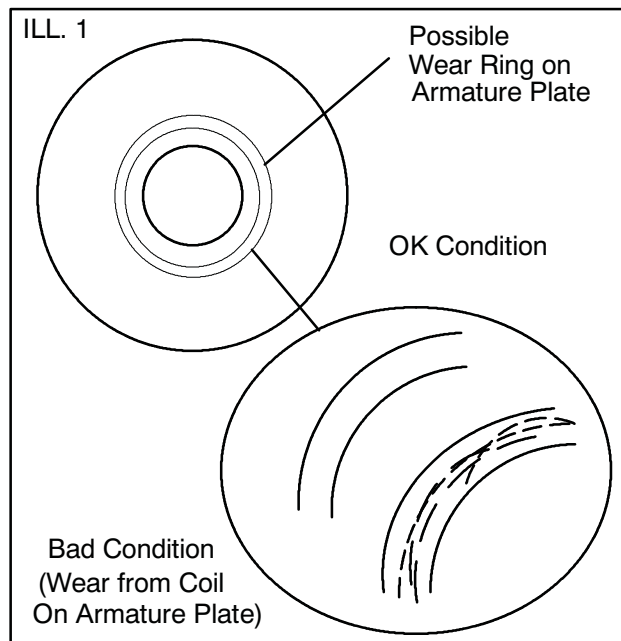
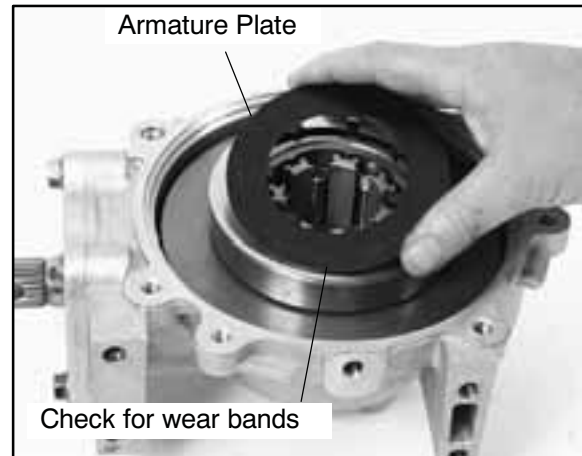
Symptom: AWD Will Not Engage.

1. Check the gearcase coil resistance. To test the gearcase coil resistance, use the coil harness (Grey & Brown/White). The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.
2. Check the minimum battery voltage at the wire (Grey & Brown/White) that feeds the hub coil wire. There should be a minimum of **11.80-12.0 Volts** present for proper operation.

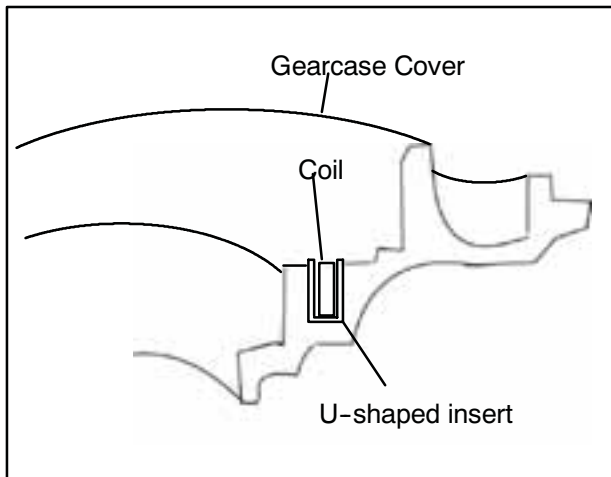


3. Inspect the armature plate for a consistent wear pattern. There should one or two distinct wear

bands (one band inside the other). If only one band of wear is present (or if there is wear between the two bands, inspect the coil area as indicated in Step 4. A band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation. See ILL. 1.

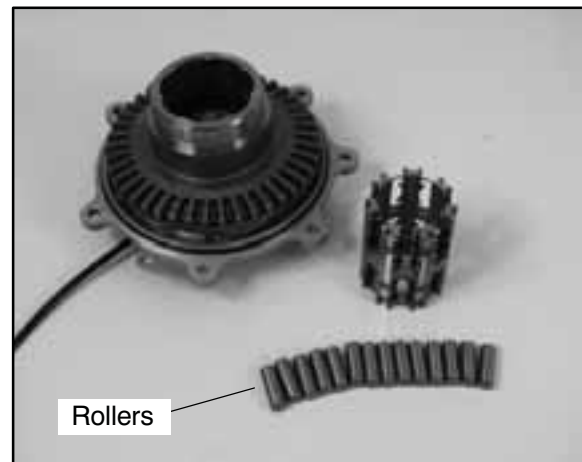


4. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature plate, thereby increasing pole gap. If the pole gap increases the coil will not be strong enough to engage the AWD system. If this is the cause order a new Plate Cover Assembly (**PN 3233952**). See Illustration next page.



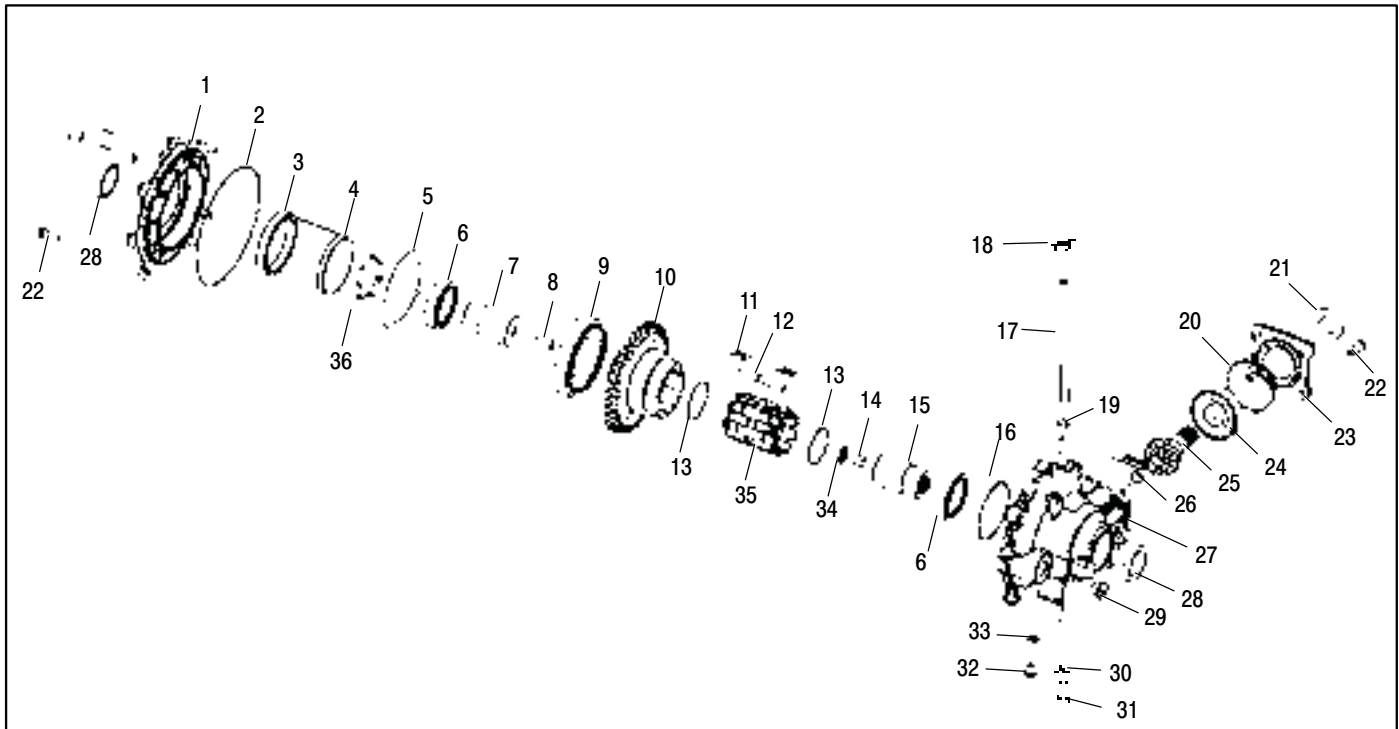
Side Cutaway View of Centralized Hilliard Cover

5. Inspect the rollers for nicks and scratches. The rollers must slide up and down and in and out freely within the roll cage sliding surfaces.





FRONT GEARCASE EXPLODED VIEW



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	20.	1	O-Ring
1.	1	Cover, Output	21.	1	Seal
2.	1	O-Ring	22.	11	Kit, Bolt
3.	1	Insert	23.	1	Cover, Input
4.	1	Coil	24.	1	Bearing, Roller Ball
5.	1	Kit, Shim Set (Incl. Shims)	25.	1	Shaft, Pinion, 11T
6.	2	Bearing, Roller Ball	26.	1	Bushing
7.	1	Hub, Race/Output, Male	27.	1	Gearcase, LH
8.	1	Pin, Dowel	28.	2	Seal, Oil
9.	1	Bearing, Roller Ball	29.	1	Plug, Oil Fill
10.	1	Clutch Housing/Ring Gear	30.	4	Washer, Spring Lock
11.	1	Spring	31.	4	Screw
12.	14	Kit, Roll	32.	1	Plug, Oil Drain
13.	2	Ring, Retaining	33.	1	Washer
14.	1	Bushing	34.	1	Bearing, Needle, Roller Thrust
15.	1	Hub, Race/Output, Female	35.	1	Roll Cage, Aluminum
16.	1	Bushing	36.	1	Plate Armature
17.	AR	Line, Fuel			
18.	1	Clip			
19.	1	Clamp, Hose			

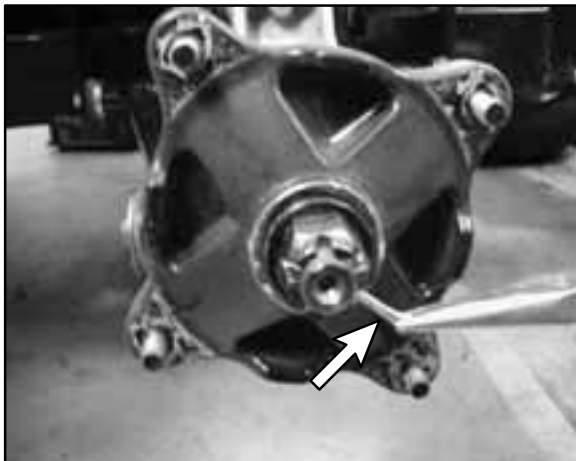


MID DRIVE BEARING **CARRIER/HUB REMOVAL** **(6X6)**

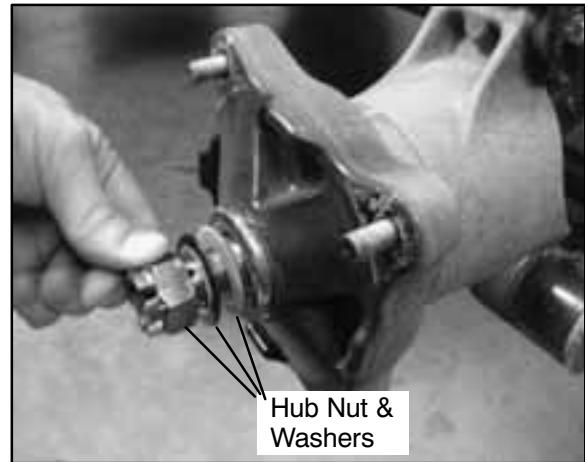
1. Lock the emergency parking brake. Safely raise the center of the machine with a floor jack. Raise the machine just enough to remove the middle wheel.
2. Remove the four wheel nuts and wheel.



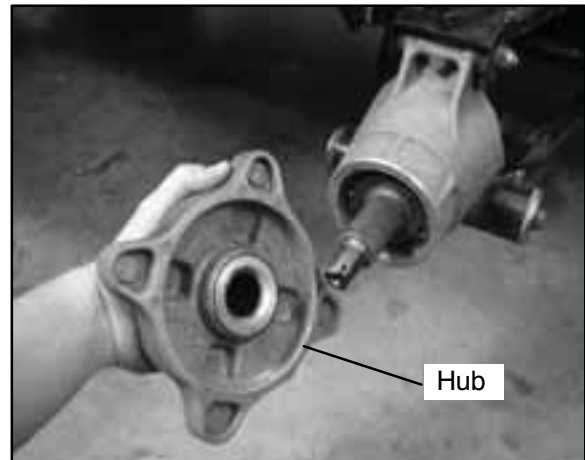
3. Remove the hub cap and cotter pin.



4. Remove the hub nut, domed washer, and flat washer.

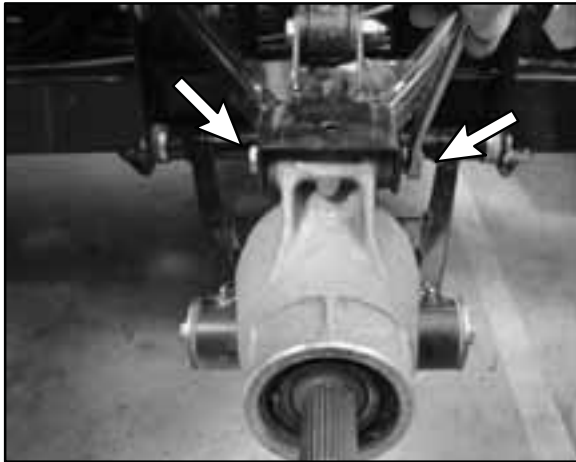


5. Remove the hub from the axle shaft.

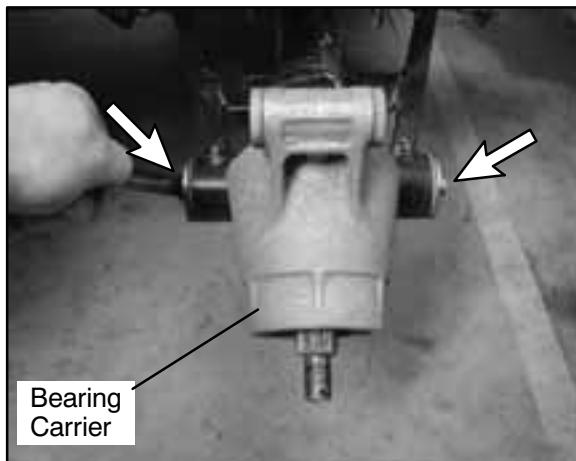




6. Remove the upper control arm bolt.



7. Remove the both lower A-arm bolts.
8. Remove the bearing carrier from the A-arm assembly.

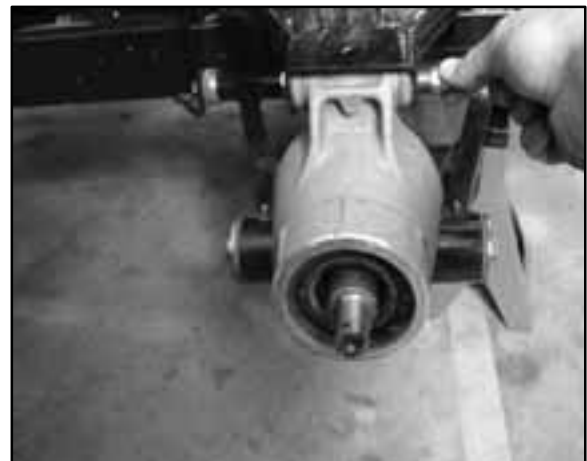


3. Install and torque both lower control arm bolts.

Lower Control Arm Bolt Torque:
40 ft. lbs. (54 Nm)

Upper Control Arm Bolt Torque:
40 ft. lbs. (54 Nm)

4. Lift bearing carrier until top aligns with upper control arm. Install and torque upper control arm bolt and torque to specification.



MIDDLE HUB INSTALLATION **(6X6)**

1. Start bearing carrier on drive shaft.
2. Align bottom of carrier housing and lower control arm. Grease and slide lower control arm bushings into place, securing corner housing.



5. Pull drive shaft outward and install hub onto driveshaft splines.



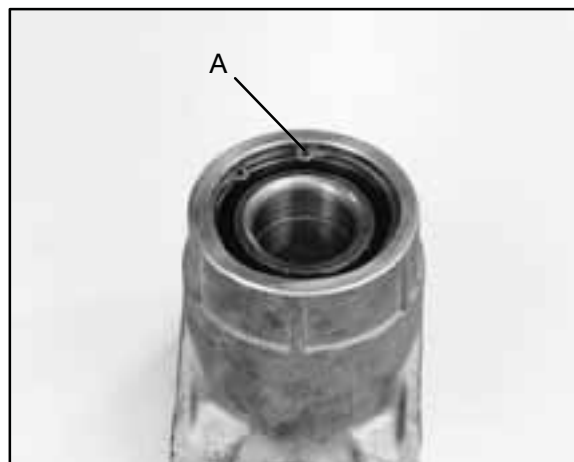
Rear Hub Nut Torque:
110 ft. lbs. (149 Nm)

Rear Wheel Nut Torque
35 ft. lbs. (47 Nm)

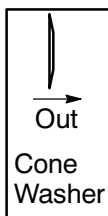
9. Install a new cotter pin. Tighten nut slightly to align holes if required.
10. Install hub cap.

MID DRIVE BEARING **CARRIER / HUB** **DISASSEMBLY (6X6)**

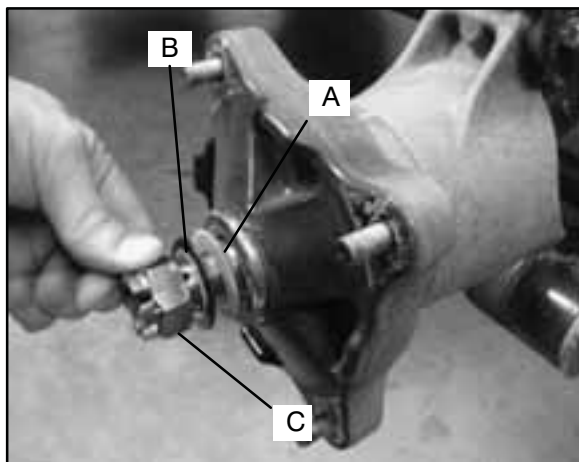
1. Remove outer snap ring (A).



6. Install the washer (A) and the cone washer (B) with domed side facing outward. (Refer to next photo)



7. Install retainer nut (C), wheel and wheel nuts.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.

NOTE: Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

8. Remove jackstand and torque the rear hub nut to 100 ft. lbs. (138 Nm) and wheel nuts to 20 ft. lbs. (27 Nm).



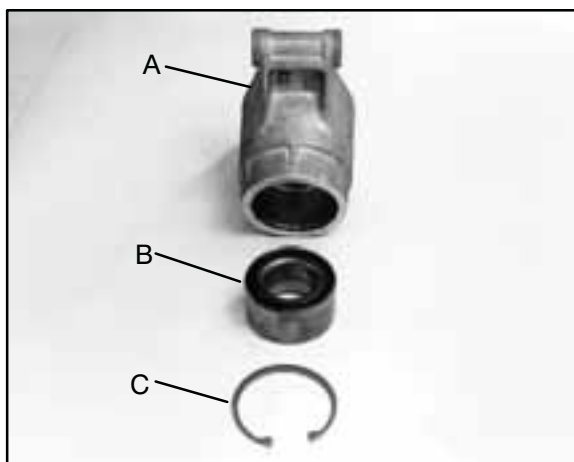
3. Inspect bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

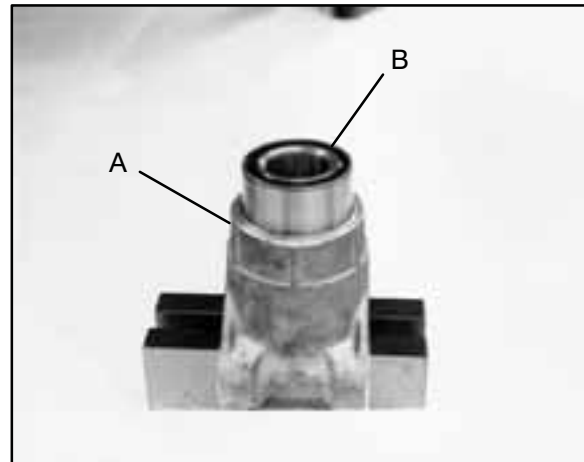
4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

MID DRIVE BEARING CARRIER/HUB ASSEMBLY (6X6)

1. Support bottom of bearing carrier housing. (A) Bearing Carrier Housing; (B) Bearing; (C) Snap Ring



2. Start bearing (B) in housing (A).



3. Press bearing into place until outer race bottoms on housing.

CAUTION:

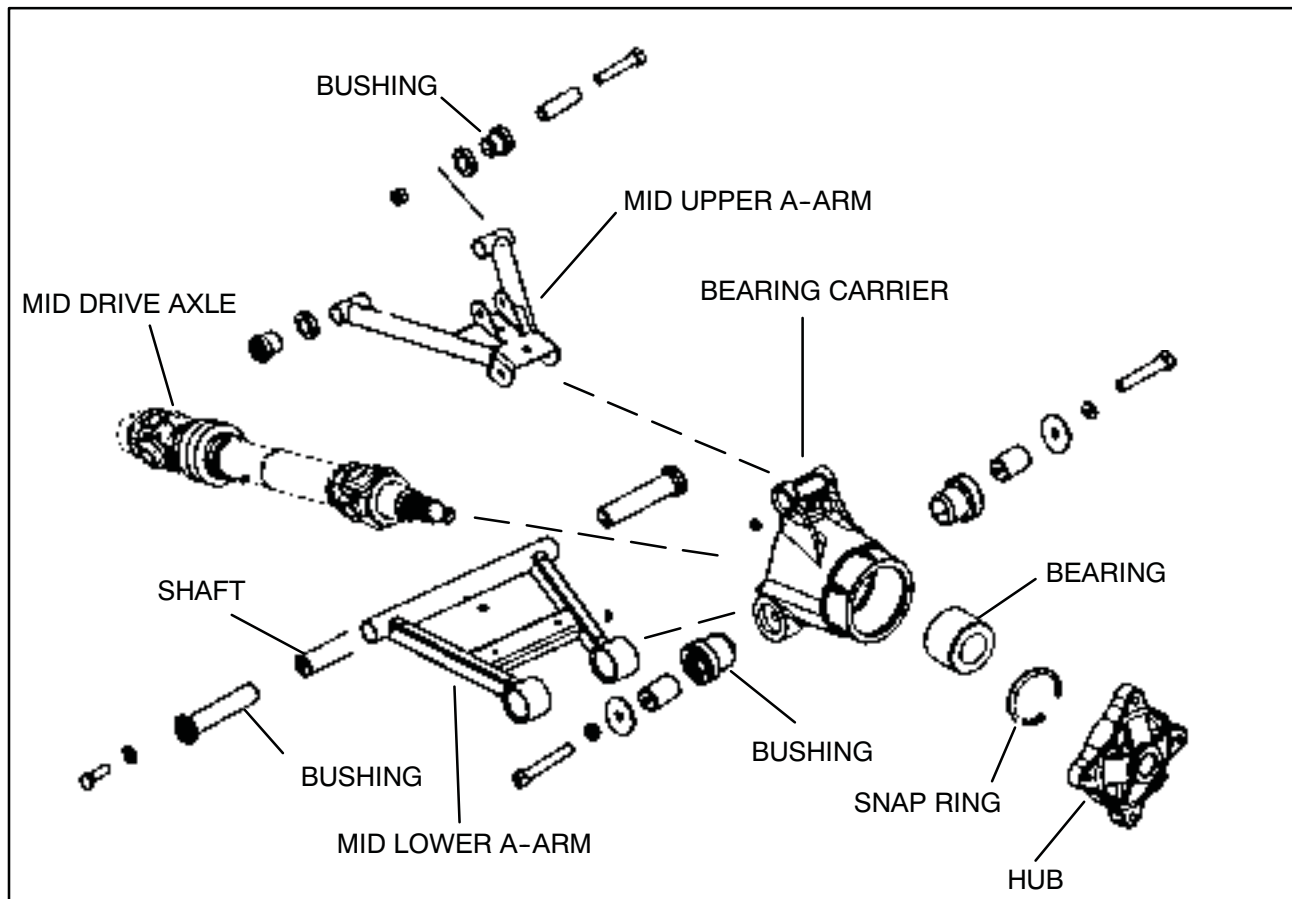
Use an arbor and press only on the outer race, as bearing damage may occur.



4. Install snap ring into groove.



MID DRIVE HUB EXPLODED VIEW (6X6)

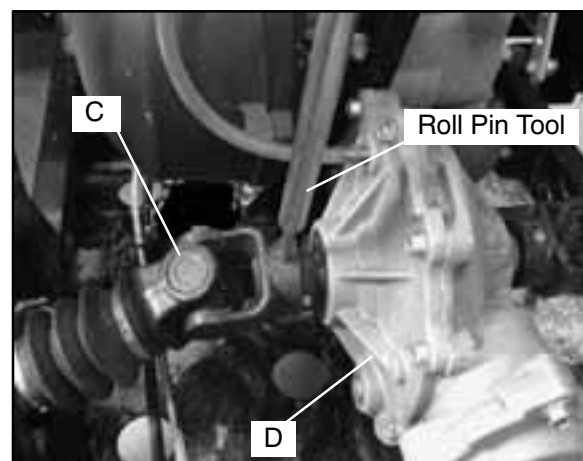


MID DRIVE SHAFT REMOVAL (6X6)

1. Repeat Steps 1-6 in the "MID DRIVE BEARING CARRIER/HUB REMOVAL" section.
2. Slide the middle axle out of the bearing carrier by pulling the bearing carrier assembly outward and down.

spring pin secures the yolk of the middle axle to the middle gearcase (D) output shaft.

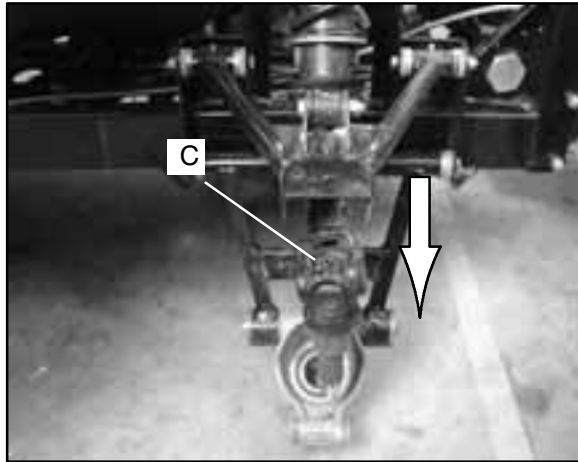
NOTE: To ease the removal of the roll pin from the middle axle and middle gearcase output shaft, remove the dump box from the frame. Refer to Chapter 5.



3. Remove the roll pin from the middle axle (C), using the Roll Pin Removal Tool (PN 2872608). The

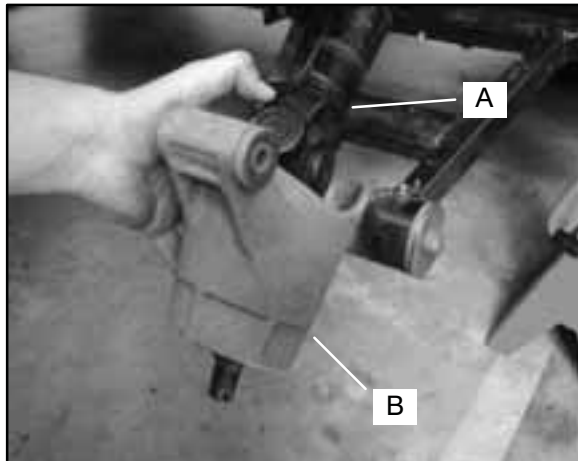


4. Pull the middle axle (C) straight out of the frame.



MID DRIVE SHAFT INSTALLATION (6X6)

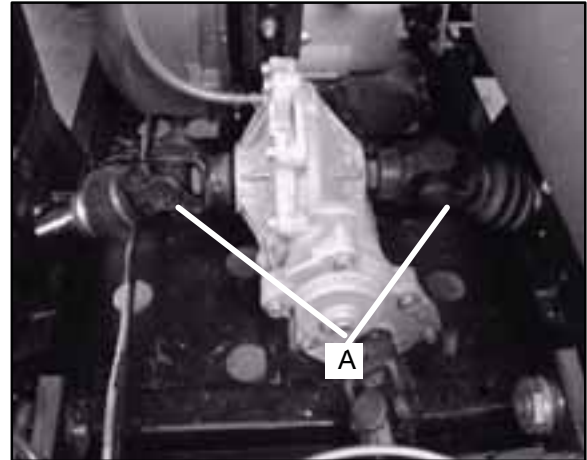
1. Slide the middle axle (A) into the bearing carrier hub (B).



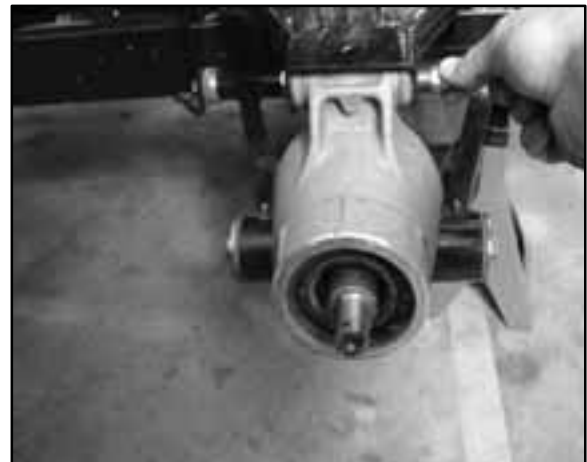
2. Apply Anti-Seize Compound onto the middle gearcase output shaft splines. Reinstall the

middle driveshaft (A) onto the middle gearcase output shaft. Be sure to align the roll pin holes of the middle driveshaft (A) and middle gearcase.

3. Install a new roll pin to secure the middle driveshaft (A) to the middle gearcase.

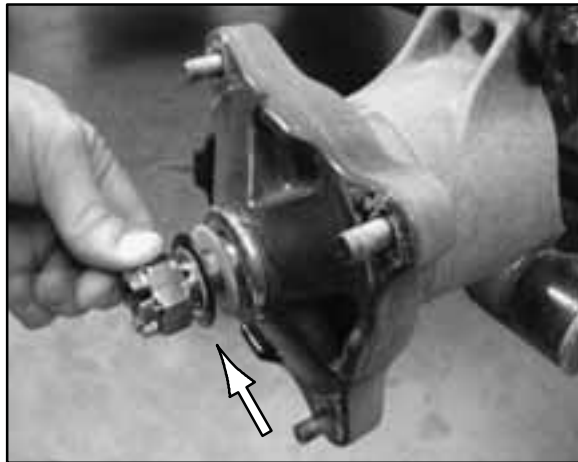


4. Lift bearing carrier into place and install bolt to upper control arm. Torque bolt to 35 ft. lbs. (48 Nm).





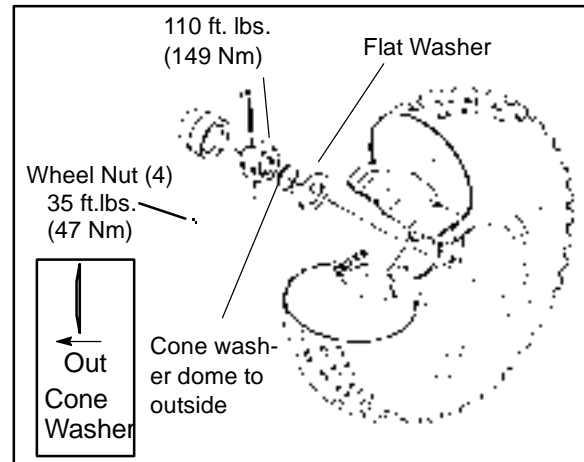
5. Install hub, flat washer, domed washer (domed side out) and nut. Torque center nut to 110 ft. lbs. (149 Nm). Install new cotter pin and hub cap.



Rear Hub Nut Torque:

110 ft. lbs. (149 Nm)

6. Install rear wheel and torque wheel nuts to specification.



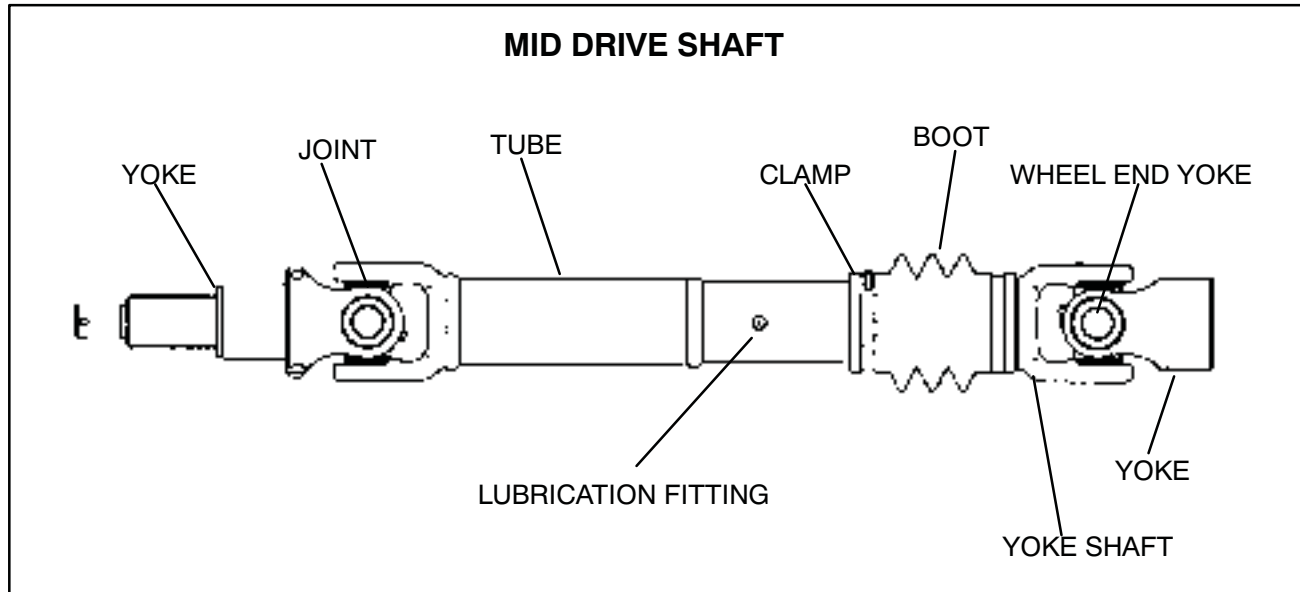
Rear Wheel Nut Torque:

35 ft. lbs. (47 Nm)

7. Grease all fittings thoroughly with Premium U-Joint Lubricant (PN 2871551).



MID DRIVE SHAFT DISASSEMBLY / ASSEMBLY (6X6)



NOTE: Drive shafts must be aligned properly to avoid vibration. Before disassembling the middle driveshaft, be sure to mark the shaft and all U-joints. Take note of the position of the grease fittings to ease assembly.

1. Remove the shaft boot clamp. Separate the middle drive shaft halves.
2. Inspect the inner and outer splines of the shafts.
3. Refer to the U-JOINT DISASSEMBLY section on Page 7.12 for axle U-joint disassembly. When disassembling U-joints, the yoke bore alignment must be inspected. Refer to Page 7.12 for the inspection procedure.

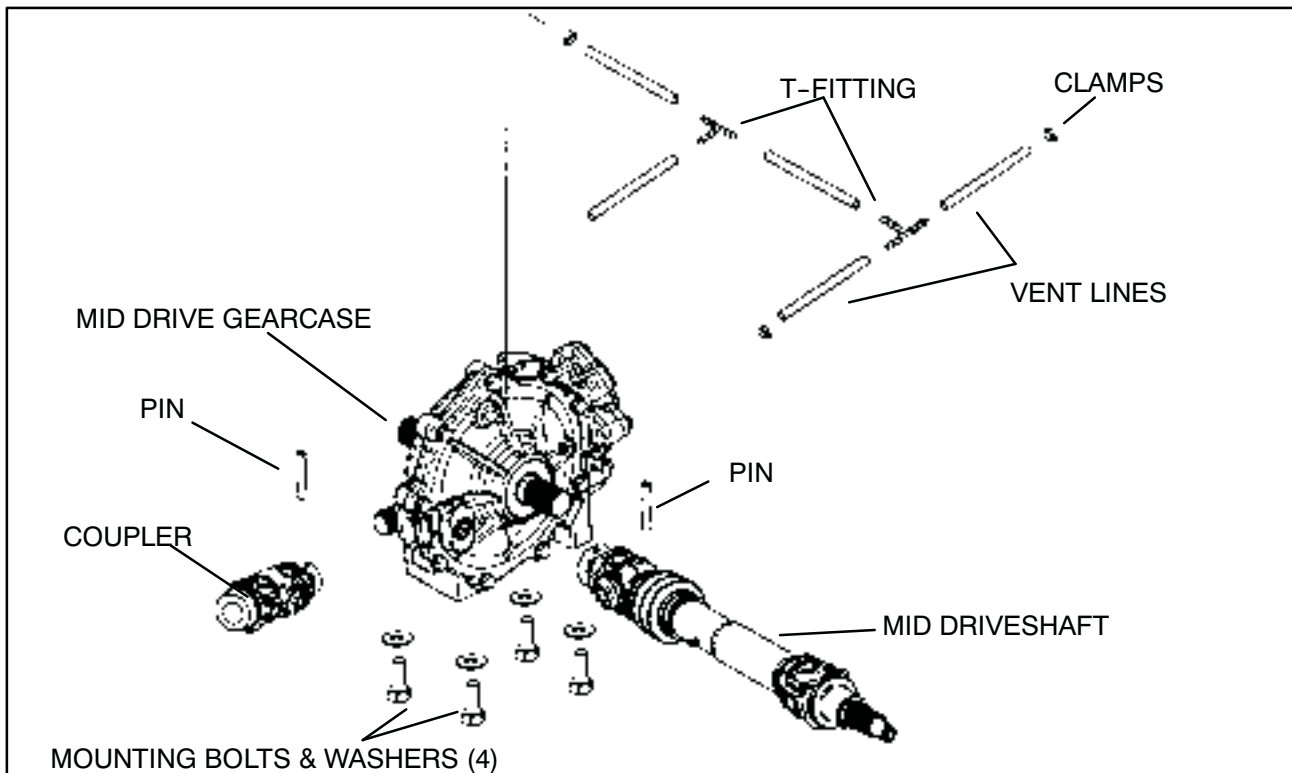
Middle Driveshaft Assembly

NOTE: When assembling U-joints, be sure to position the grease fittings correctly.

1. Assemble the axle U-joints as described in the U-JOINT ASSEMBLY section Page 7.14. Inspect the yoke bore alignment on all of the yokes. If a yoke is twisted, warped, or misaligned, it must be replaced or pre-mature joint failure will result.
2. Install the drive shaft boot on one of the drive shaft halves.
3. Grease the splines of the shaft with Polaris Premium U-Joint Grease (**PN 2871551**).
4. To prevent driveline vibration, the inner and outer yokes must be aligned properly. Assemble the rear drive shaft, aligning the inner and outer yokes and grease fittings.
5. Install the boot clamps using the Boot Clamp Pliers (**PN 8700226**).
6. Collapse the driveshaft assembly and grease until grease starts to run out of the hole on the end of the shaft.

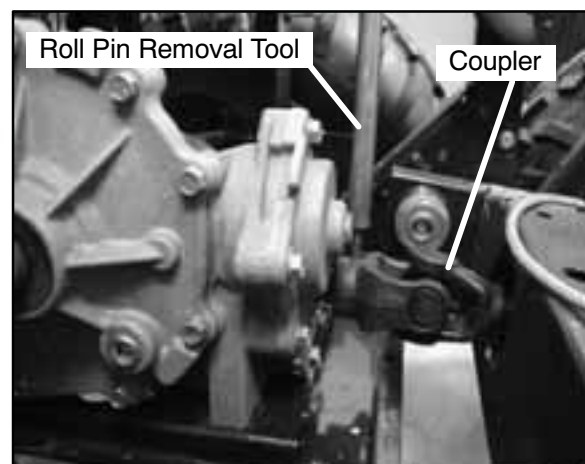
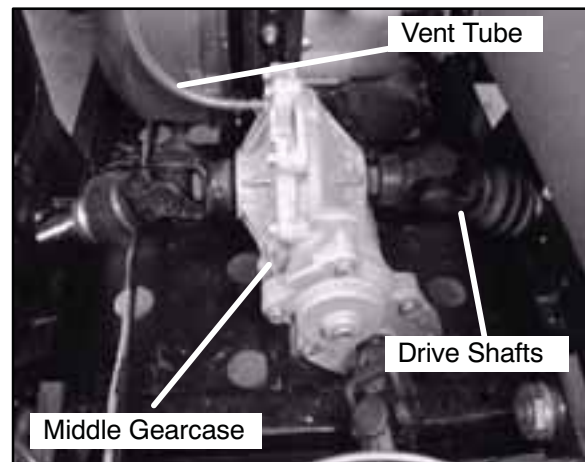


MID DRIVE GEARCASE REMOVAL



NOTE: To ease the removal of the middle axle gearcase, remove the box from the frame. Refer to the Box Removal Procedure in Chapter 5.

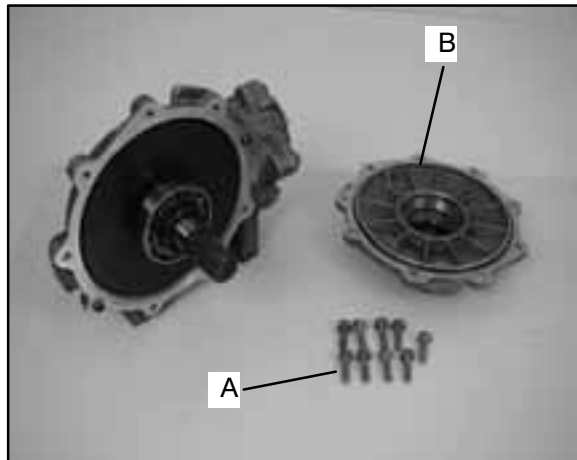
1. Remove the vent line clamp and vent line from the top of the middle drive gearcase.
2. Repeat Steps 1-3 in the MID DRIVESHAFT REMOVAL section on Page 7.27.
3. After the middle axle drive shafts are removed from the middle drive gearcase, remove the coupler (Step 3).
4. Use the Roll Pin Removal Tool (**PN 2872608**) to remove the roll pin that secures the coupler to the middle drive gearcase.
5. Remove the four bolts and washers that secure the gearcase to the frame. The bolts are accessible through the skid plate on the bottom of the frame.
6. With the drive shaft's and coupler removed from the middle gearcase output shaft, lift the gearcase out of the frame.





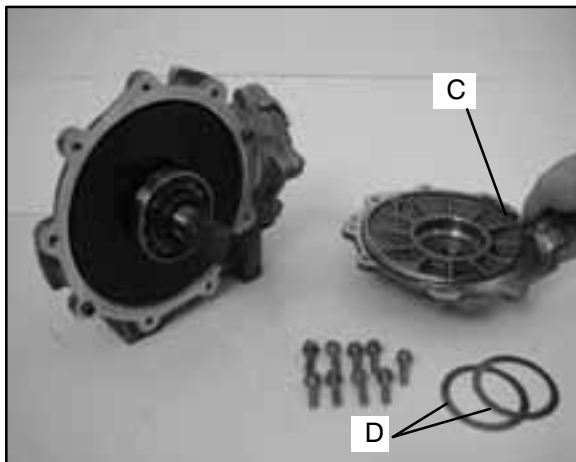
MID DRIVE GEARCASE DISASSEMBLY

1. Drain the oil from the mid drive gearcase. Properly dispose of the oil.
2. Remove the output cover bolts (A) and the output cover (B).

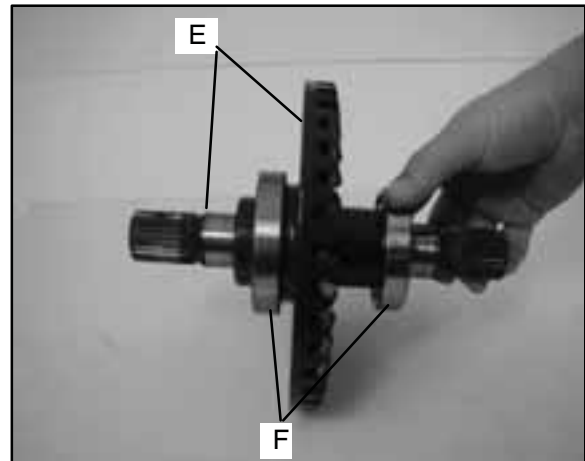


3. Remove the O-ring (C) and two shims (D) from the output cover.

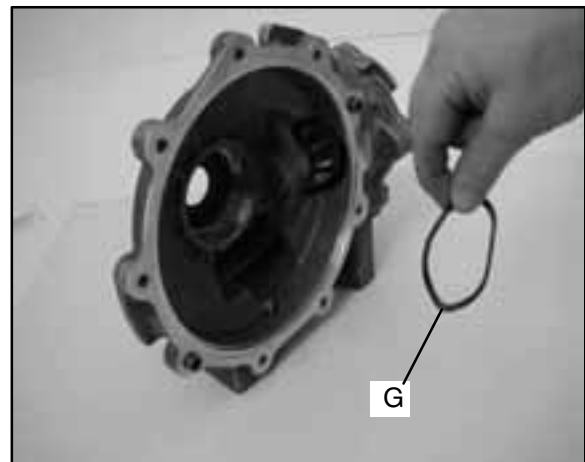
NOTE: The two shims are different of thickness. Be sure to note the placement of the shims as they are removed from the output cover for later installation.



4. Remove the output shaft and ring gear assembly (E) from the gearcase. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Inspect and spin the bearings (F), the bearings should rotate smoothly.

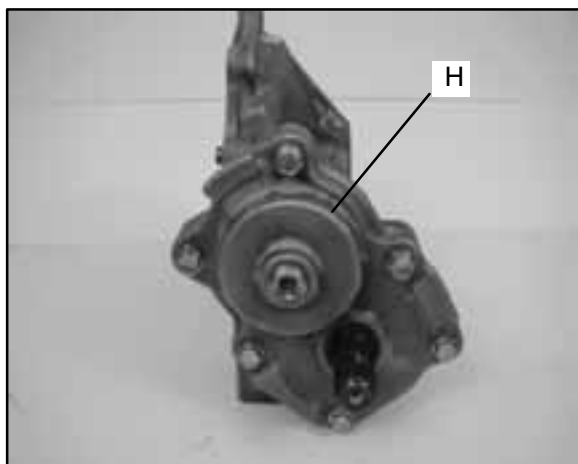


5. Remove the wave spring (G) from the gearcase assembly.

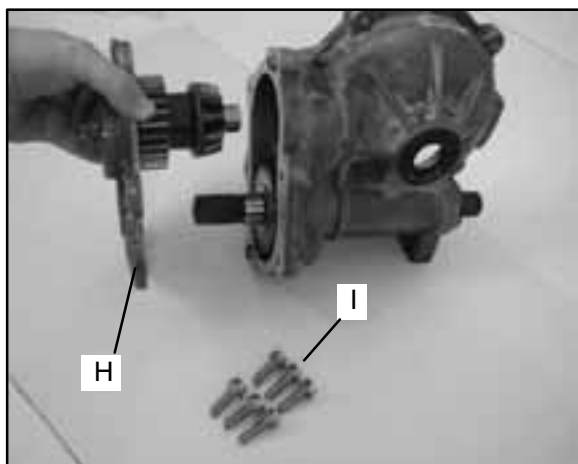




6. Remove the bolts from the input cover (H).

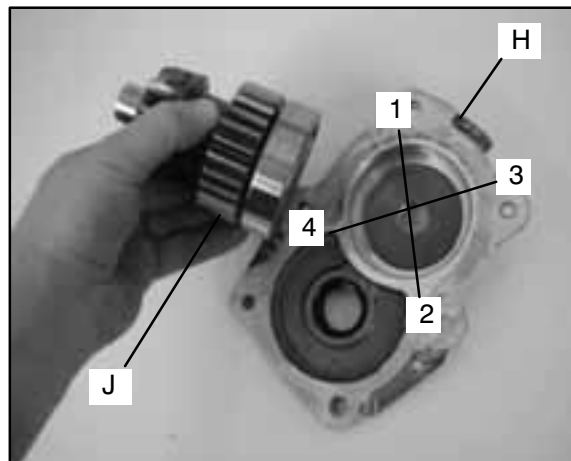


7. Remove the input cover bolts (I). Remove the input cover (H) and pinion gear assembly from the gearcase.

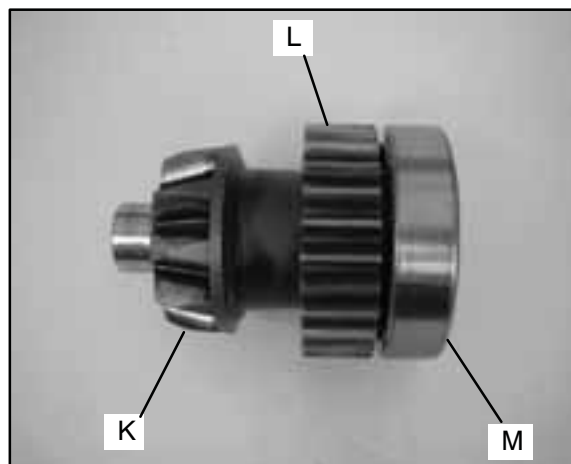


8. Remove the pinion gear (J) assembly from the front cover (H). If the pinion gear does not come loose from the front cover, use the following steps to aid in removal:

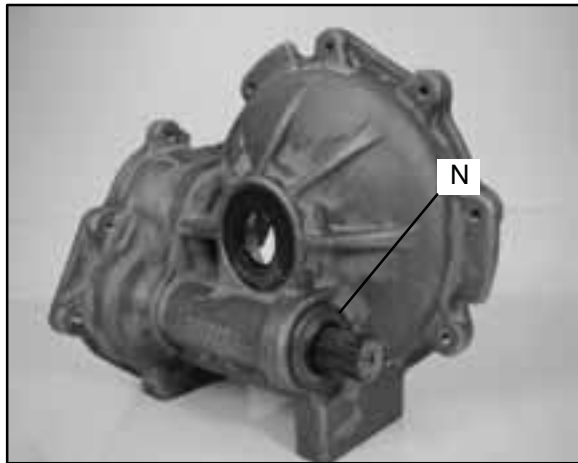
- Hold the pinion gear assembly
- Use a rubber mallet to lightly tap around the bearing cup of the front cover
- Tap the front cover in an X pattern (follow the pattern in the photo on the right), until the pinion gear assembly comes loose



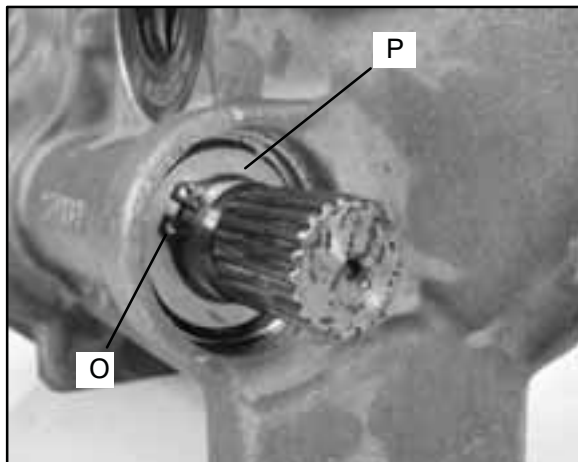
9. Inspect the pinion gear (K) and 26T output gear (L) for nicks or uneven wear. Inspect the bearing (M), the bearing should spin smoothly. Replace the parts as needed.



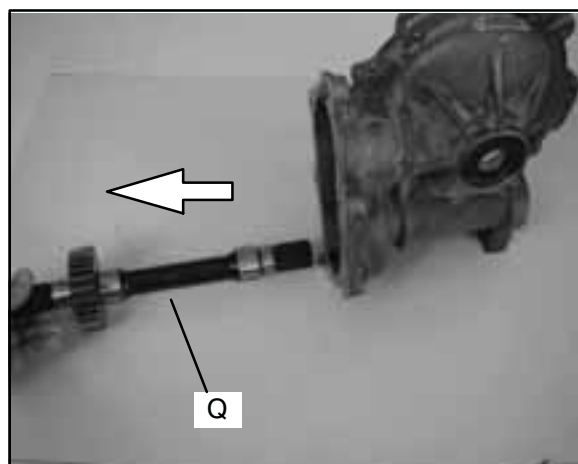
10. Remove the rear output seal (N).



11. Remove the retaining ring (O) and shim (P) from the rear output thru shaft.

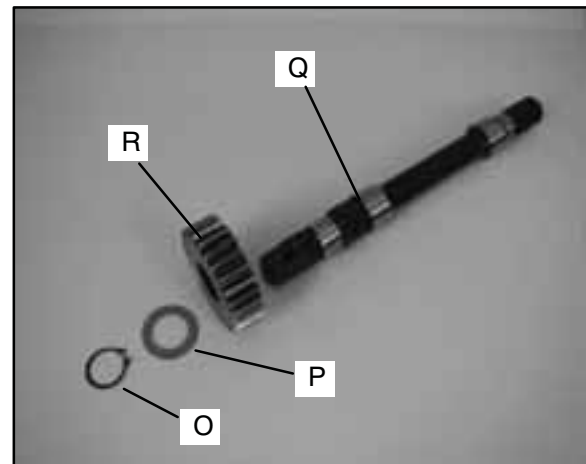


12. Carefully pull the output thru shaft (Q) through the gearcase.

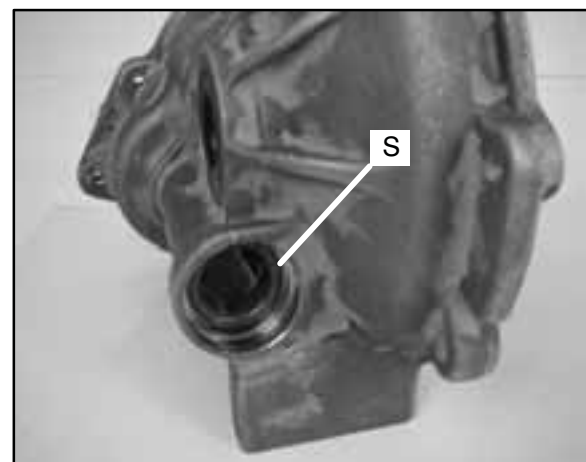
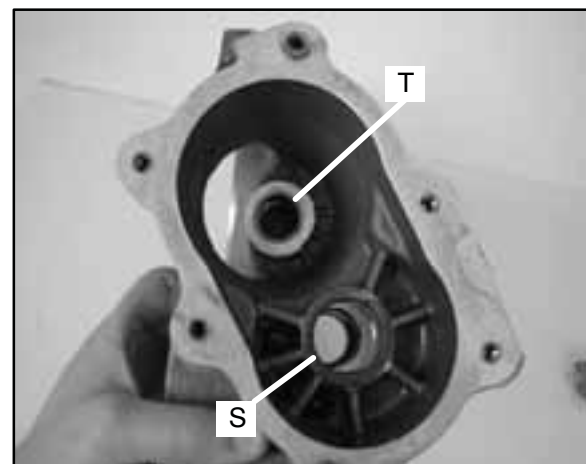


13. Remove the retaining ring (O), shim (P), and input gear (R) from the output thru shaft (Q). Inspect the input gear for abnormal wear, broken, or

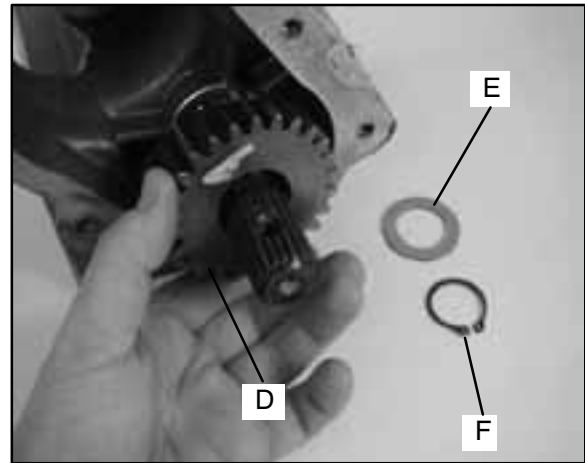
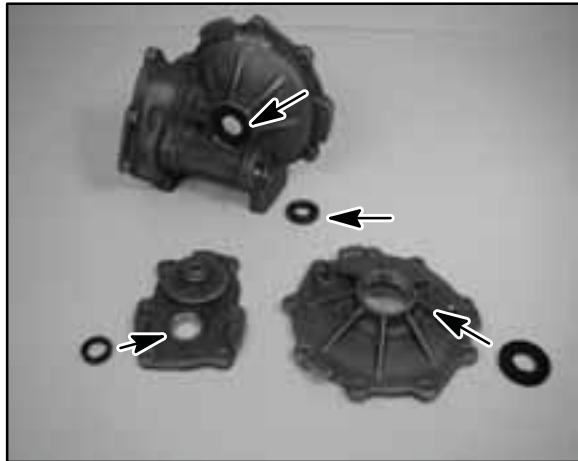
chipped teeth.



14. Inspect the two flange bearings (S) inside the gearcase. Inspect the pinion shaft bushing (T) for wear that is inside the gearcase.

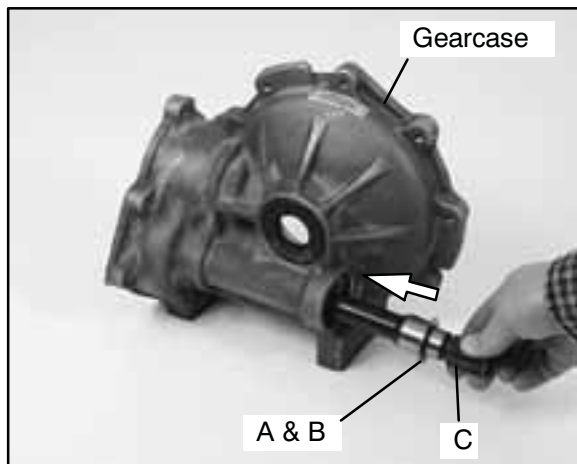


15. Replace all O-ring, seals, and worn components. Replace the seals as shown in the photo.



MID DRIVE GEARCASE ASSEMBLY

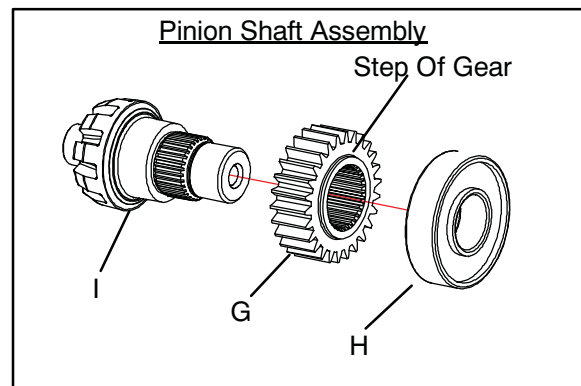
1. Install the shim (A) and a **new** retaining ring (B) onto the output end of the output thru shaft (C). Install the output thru shaft into the gearcase.



2. Install the 26T input gear (D), shim (E), and a **new** retaining ring (F) onto the output thru shaft.

3. Assemble the pinion shaft assembly (if previously disassembled). Install the 26T gear (G) and bearing (H) onto the pinion shaft (I).

NOTE: When replacing the 26T output, be sure the step of the gear is facing towards the bearing (See Below and next page).





Pinion Shaft Assembly Assembled

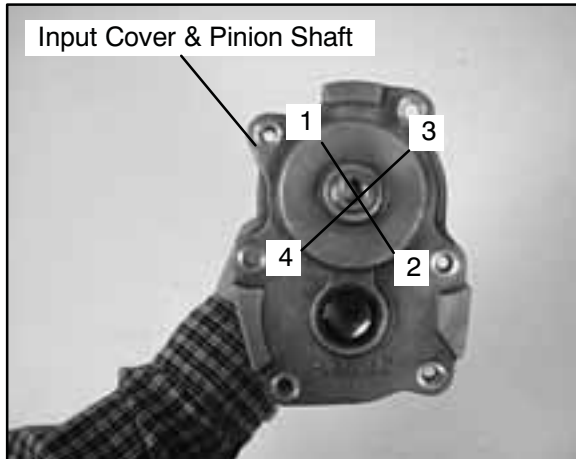


4. Install the pinion shaft assembly into the input cover.

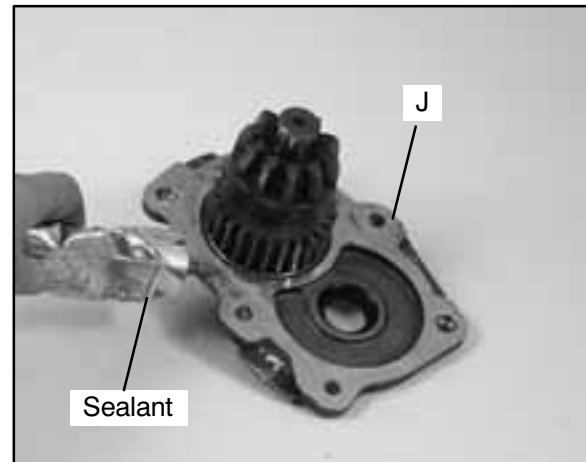
NOTE: Alignment of the pinion shaft bearing into the input cover maybe be difficult. If needed, use the following steps to aid in installation (refer to photo on right):

- Hold the pinion gear assembly
- Use a rubber mallet to lightly tap on the front of the input cover, around the bearing cup
- Tap the front cover in an X pattern (follow the pattern in the photo on the right), until the pinion gear assembly comes loose

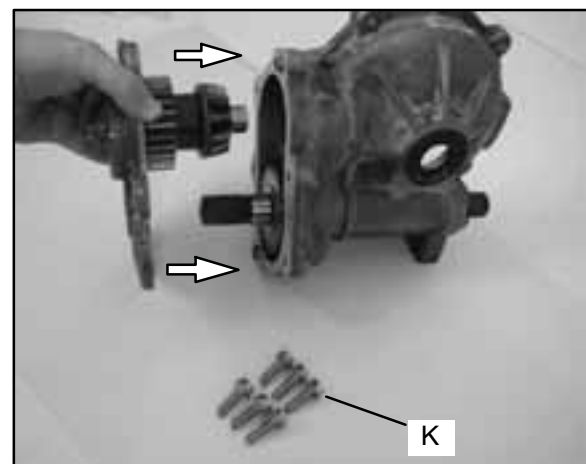
Input Cover & Pinion Shaft



5. Apply Polaris Crankcase Sealant (PN 2871557) to the inside surface of the input cover (J).

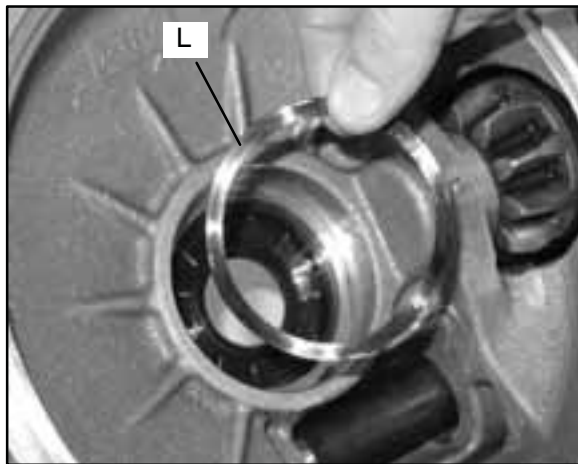


6. Install the pinion shaft assembly and input cover onto the gearcase. Install the input cover bolts (K). Torque the bolts to 18-23 ft. lbs. (24-31 Nm).

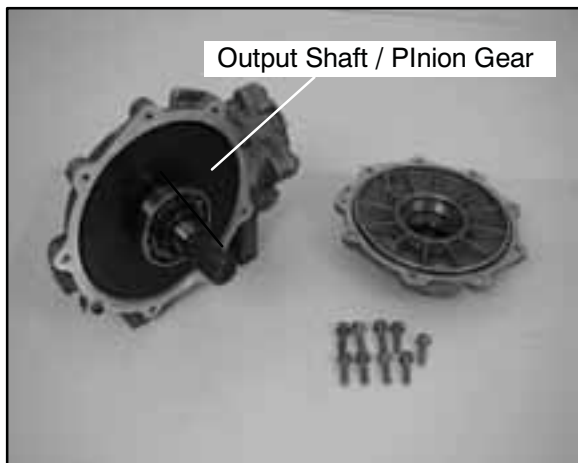




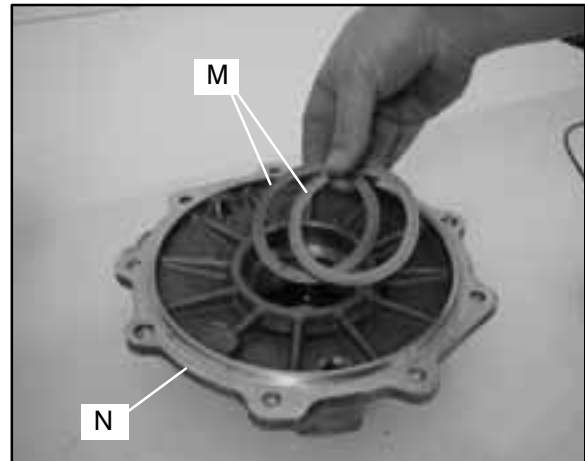
7. Install the wave spring (L) into the gearcase assembly. Be sure the wave spring is fully seated into the bearing cup of the gearcase.



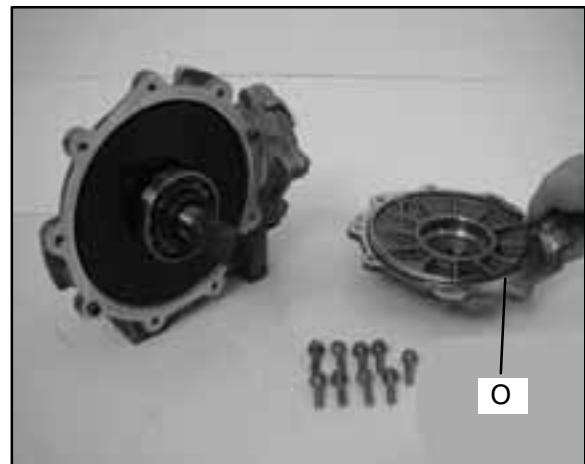
8. Install the output shaft and ring gear into the gearcase. Be sure the 10T input pinion gear and the output pinion gear mesh smoothly.



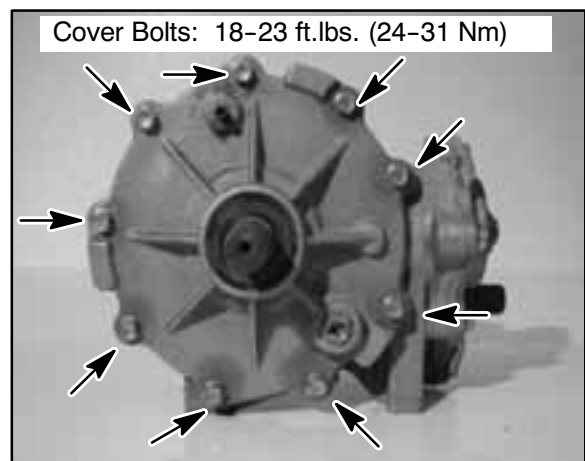
9. Install the shims (M) into the output cover (N). Install the shims in the order that they were removed during the disassembly process.



10. Install a new O-ring (O) onto the output cover.

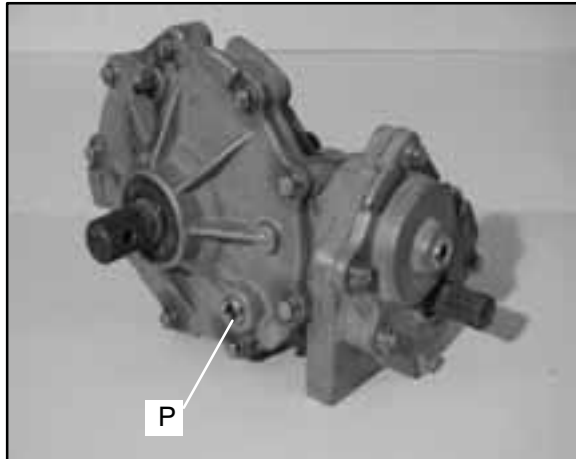


11. Carefully install the output cover onto the gearcase. Install the output cover bolts. Torque the bolts to 18-23 ft. lbs. (24-31 Nm).



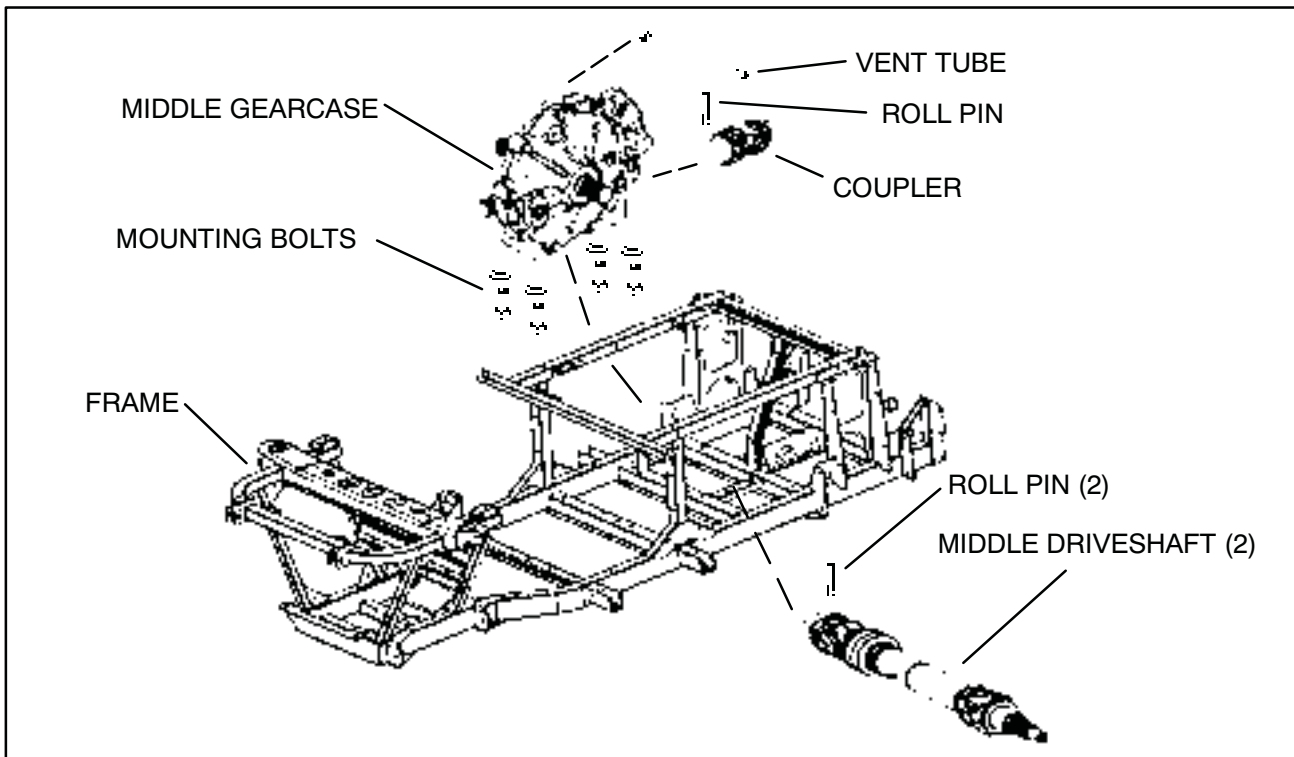
**Input Cover Bolt Torque:****18-23 ft. lbs. (24-31 Nm)****Middle Gearcase Specifications:****Capacity: 6.75 oz. (200 ml)****Specified Lubricant: Polaris Gearcase
Lubricant (PN 2871653)****Fill Plug Torque: 14 ft. lbs. (19 Nm)**

12. Remove the fill plug (P) and fill the mid gearcase with 6.75 oz. (200 ml) of Polaris Gearcase Lube (PN 2871653). Torque the fill plug to 14 ft. lbs. (19 Nm).

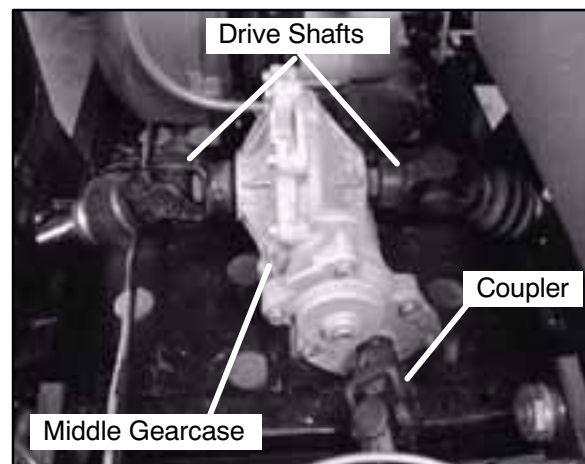




MID DRIVE GEARCASE INSTALLATION

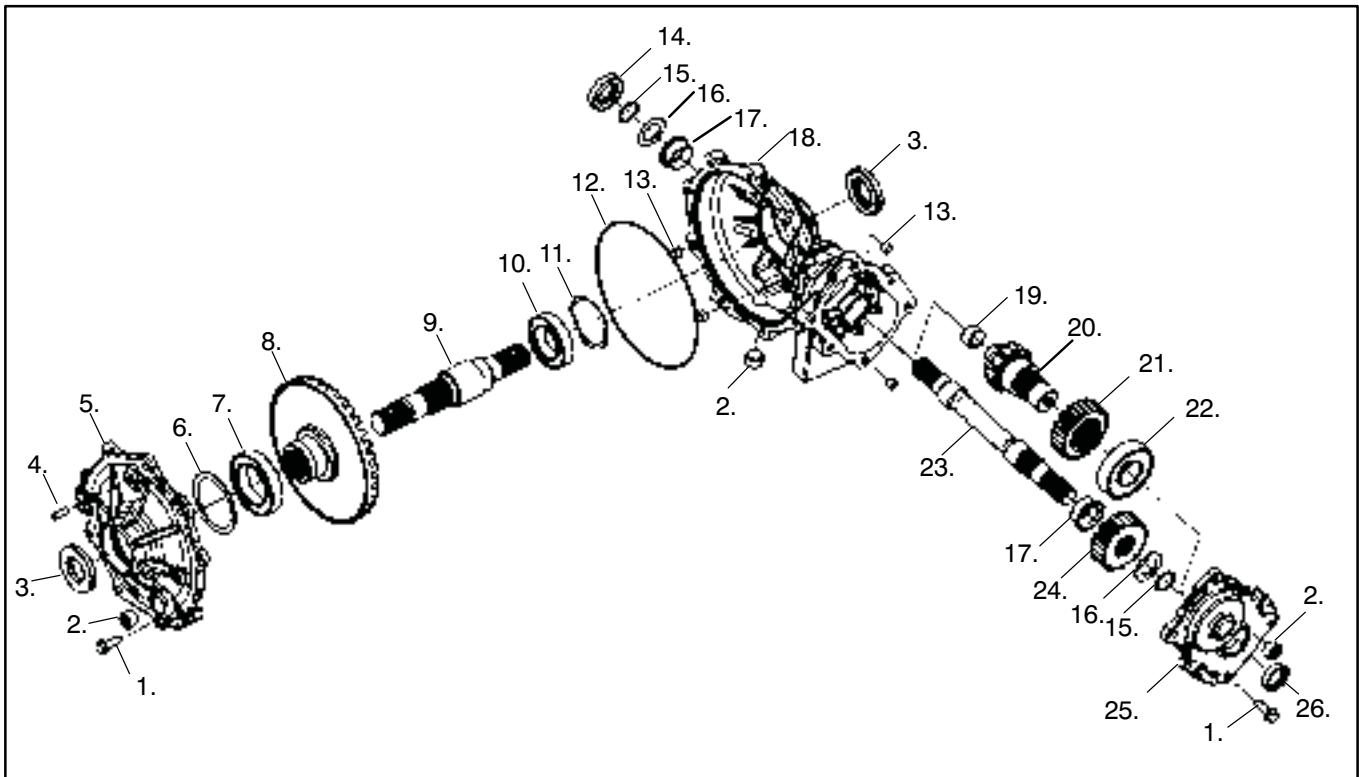


1. Place the middle gearcase in the frame assembly.
2. Install the coupler to the middle gearcase, but do not install the new roll pin yet.
3. Install the four middle drive gearcase bolts. Torque the bolts to 30 ft. lbs. (41 Nm) in a cross pattern.
4. Install a new roll pin into the coupler and middle gearcase rear output shaft.
5. Install new roll pins into each of the middle axles and middle gearcase output shafts.
6. Install the vent tube and clamp.
7. Lift bearing carrier into place and install bolt to upper control arm. Torque bolt to 35 ft. lbs. (48 Nm). Refer to the MID DRIVE SHAFT INSTALLATION section on Page 7.28–7.29 for more details.
8. Install hub, flat washer, domed washer (domed side out) and nut. Torque center nut to 100 ft. lbs. (138 Nm). Install new cotter pin and hub cap.
9. Install rear wheel and torque wheel nuts to specification.
10. Grease all fittings thoroughly with Premium U-Joint Lubricant (PN 2871551).





MID DRIVE GEARCASE EXPLODED VIEW (6X6)



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	14.	1	Seal, Triple Lip
1.	15	Screw	15.	2	Ring, Retaining
2.	3	Plug	16.	2	Washer, Thrust
3.	2	Seal	17.	2	Bushing
4.	1	Tube, Vent	18.	1	Gearcase, R11
5.	1	Cover, Output	19.	1	Bushing
6.	1	Shim	20.	1	Pinion, 10T
7.	1	Bearing, Ball	21.	1	Gear, 26T Output
8.	1	Gear, Ring 37T	22.	1	Bearing, Ball
9.	1	Shaft, Output	23.	1	Shaft, Output
10.	1	Bearing, Ball	24.	1	Gear, 26T Input
11.	1	Spring, Wave	25.	1	Cover, Input
12.	1	O-Ring	26.	1	Seal, Triple Lip
13.	4	Pipe, Knock			



REAR HUB INSPECTION

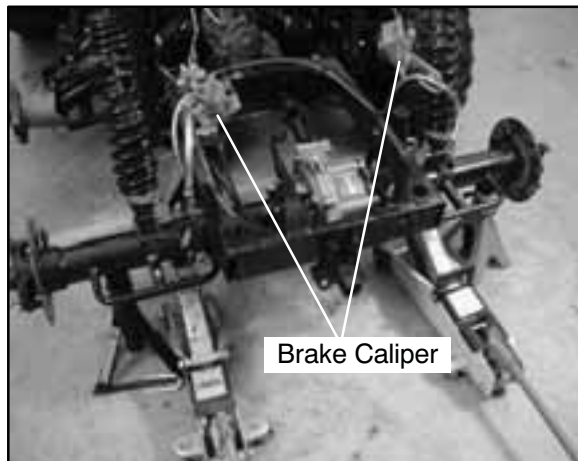
1. Support machine securely with rear wheels elevated.
2. Grasp wheel/hub and check for movement.
3. If movement is detected, inspect hub, hub nut torque and bearing condition and correct as necessary.

REAR DIFFERENTIAL REMOVAL/INSPECTION

1. Jack up vehicle and support on frame and swing are.
2. Remove rear wheels.
3. Remove the brake caliper. Suspend the brake caliper from the frame with wire (both sides).

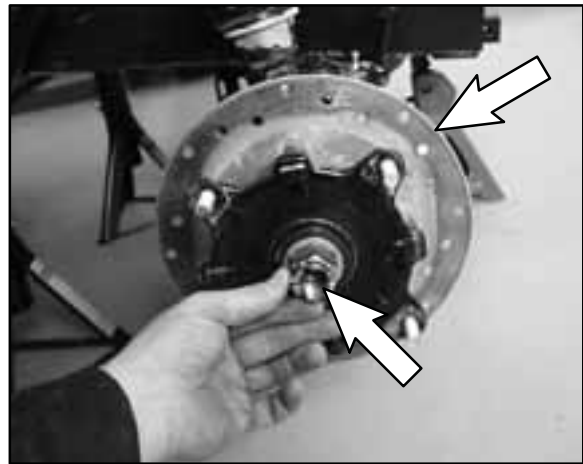
CAUTION:

Serious injury could occur if machine tips or falls.



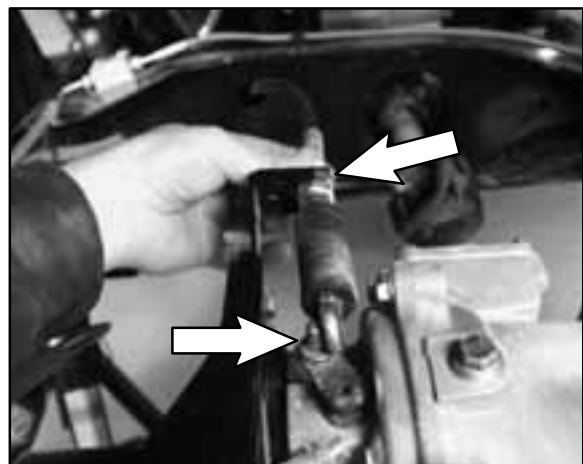
4. Remove the hub cover, cotter pin, spindle nut and washer (both sides).

5. Pull the hub off of the axle.



NOTE: ONLY 2x4 and 4x4 models have an actuator on the rear gearcase. Steps 6-8 apply only to the 2x4 and 4x4 models. The 6x6 model does not have the rear gearcase actuator.

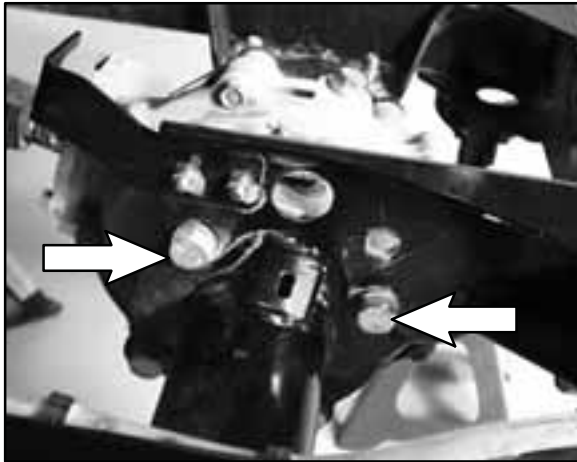
6. Remove the cotter pin from the rear gearcase bellcrank. Lift the actuator loose from the bell crank.
7. Loosen the jam nuts that secure the actuator to the bracket. Place the actuator to the side.
8. Remove the hose clamp from the rear gearcase breather hose. Remove the breather hose.



9. Remove the bottom shock bolts and shocks (both sides).

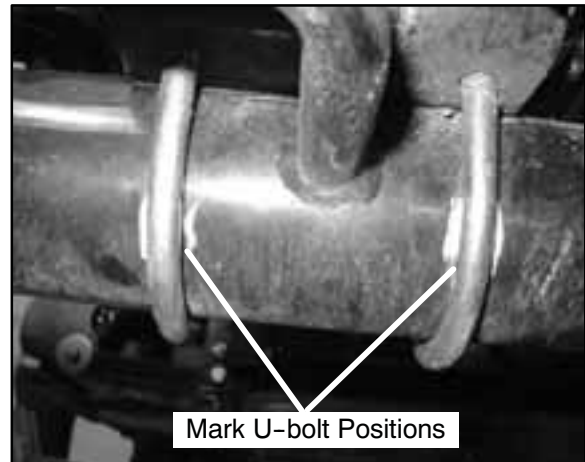


10. Remove the two bolts that secure the rear axle housing to the frame.

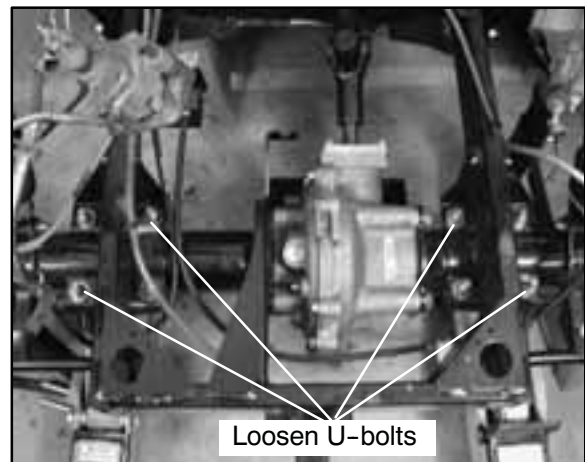


11. Mark the positions of the the four U-bolts that secure the axle to the frame. This will aid with proper U-bolt and axle placement during

reassembly.



12. Loosen the four U-bolts. Loosen each U-bolt nut a few turns at a time, this will reduce stress on all of the U-bolts during U-bolt removal.

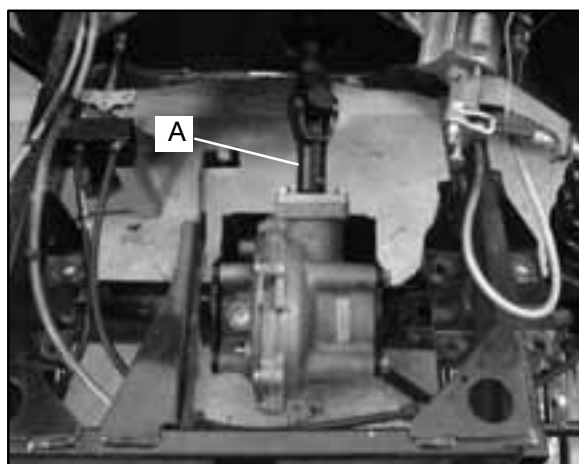




13. With the U-bolts removed, carefully lower the rear axle assembly from the frame. Pull the axle assembly out from the frame.

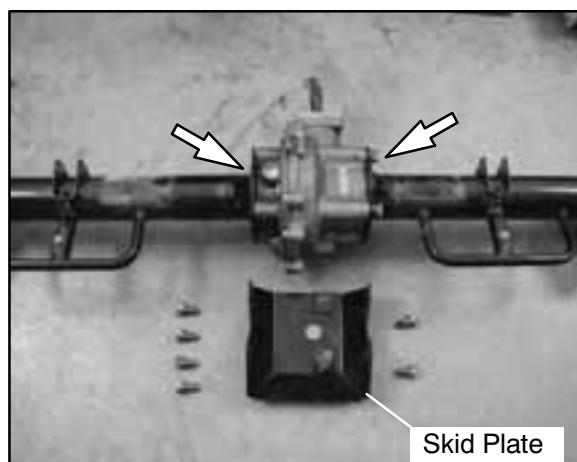
NOTE: The drive shaft yolk slides off of the rear gearcase (A).

NOTE: Use caution when removing the rear axle assembly. Extra jacks may be needed to lower the rear axle assembly safely.

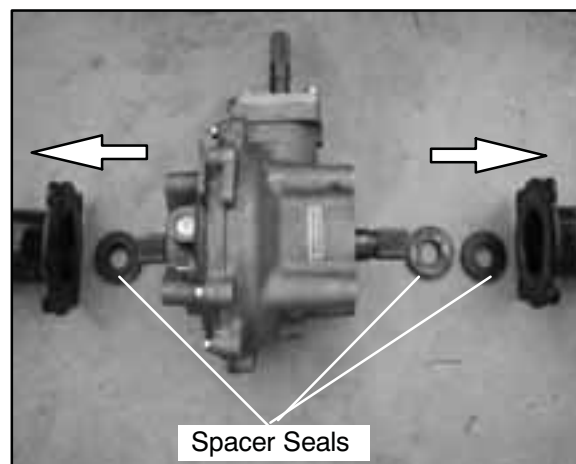


Rear Axle Tube Removal

14. Place the rear axle assembly on a clean surface.
15. Remove the bolts that secure the rear gearcase to the axles.
16. Remove the rear gearcase skid plate.



17. Remove the axle and axle tube's from the rear gearcase. Note the placement of the axle spacer seals for placement during reassembly.



18. Slide the axles out of each axle tube.

NOTE: Make note of the side each axle was removed.

19. Inspect the splines on the axle ends and the splines on rear gearcase for chips or wear. Replace as needed.



**Bearing Removal/Installation**

20. Remove the retaining ring from the axle tube.



21. Remove the bearings from the axle tube with a bearing puller. Inspect the bearing surface for scoring or nicks. Spin the bearing to check the ball bearings for smoothness. Replace the bearing if needed.



22. Reinstall the bearing using a press.



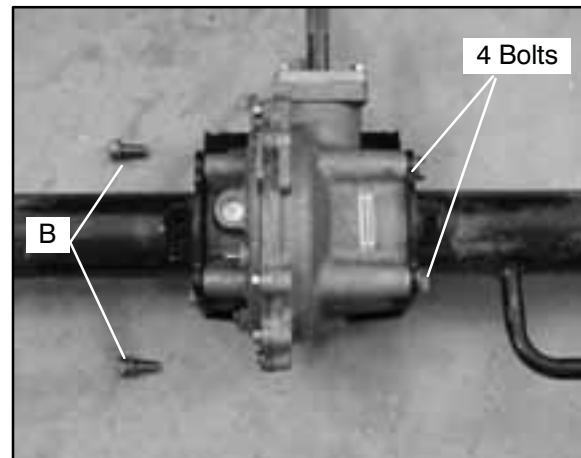
NOTE: The bearing should be properly lubricated before installation.

23. Reinstall the retaining ring.

**REAR AXLE HOUSING
INSTALLATION**

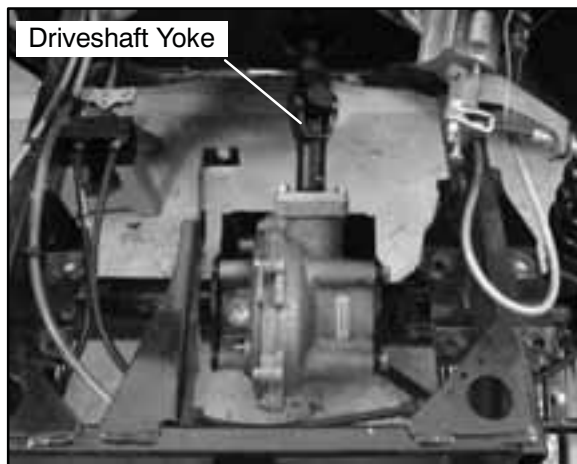
1. Lube the splines of the rear gearcase with anti-seize.
2. Reinstall the axle spacer seals. Reinstall the axle onto the rear gearcase (both sides) Reinstall the axle tube over the axle and attach it to the gearcase.
3. Install and tighten the four bolts onto the right side of the gearcase. Install and tighten the two bottom bolts to the left side of the gearcase. Do not torque the bolts.

NOTE: The two top gearcase to tube bolts (B) on the left side are installed into the frame later in this assembly procedure.





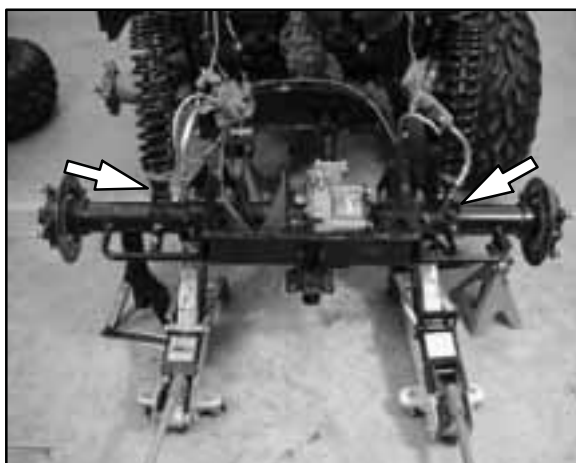
4. Fit the rear axle assembly up to the frame. Slide the rear driveshaft yoke onto the rear gearcase input shaft.



5. Fit the rear axle assembly up to frame. Attach the rear axle assembly to the shocks. Leave the shock bolts finger tight until assembly is complete.

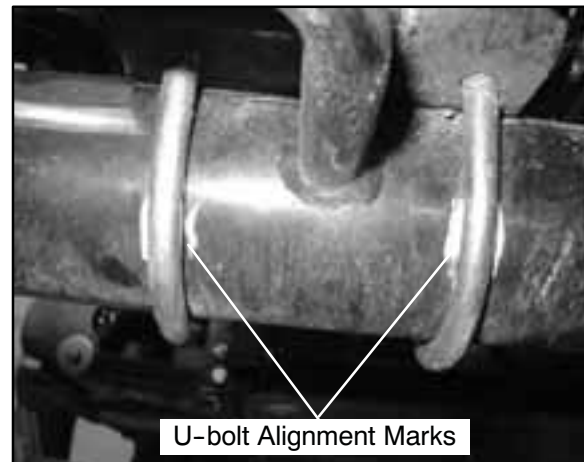
NOTE: Use a jack or another person to assist with the rear axle assembly installation.

NOTE: Use caution when removing the rear axle assembly. Extra jacks maybe needed to raise the rear axle assembly safely.

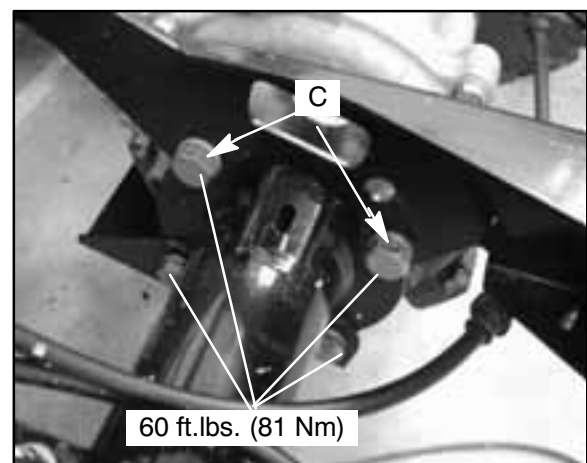


6. Install the four U-bolts. Align the U-bolts with the white marks previously made on the axle tube for proper rear axle alignment.

NOTE: Use a floor jack to help align the rear axle assembly for the U-bolt installation.



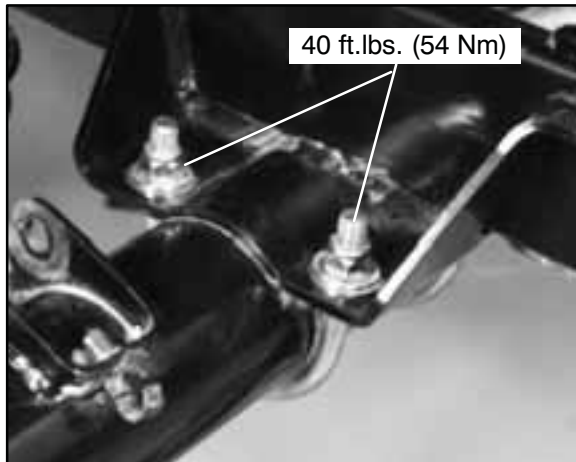
7. Install the U-bolt nuts, but do not tighten the nuts.
8. Install the two frame to gearcase bolts (C). Torque the gearcase bolts to 60 ft. lbs. (81 Nm) (Both Sides).



**Axle Tube to Gear Case
Bolt Torque:
60 ft. lbs. (81 Nm)**

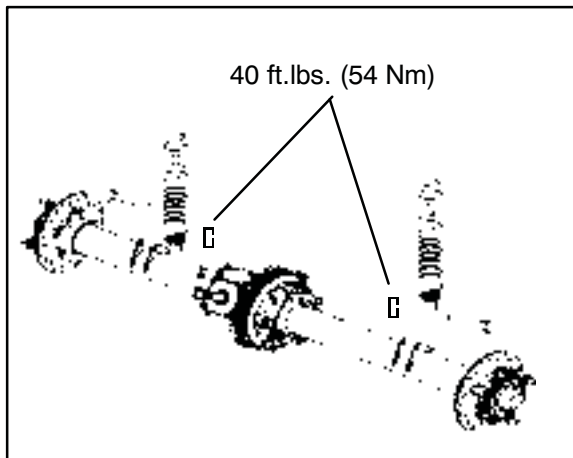


9. Torque the U-bolts nuts to 40 ft.lbs. (54 Nm).



U-Bolt Nut Torque:
40 ft. lbs. (54 Nm)

10. Torque the rear coil over shock bolts to 25 ft. lbs. (35 Nm).

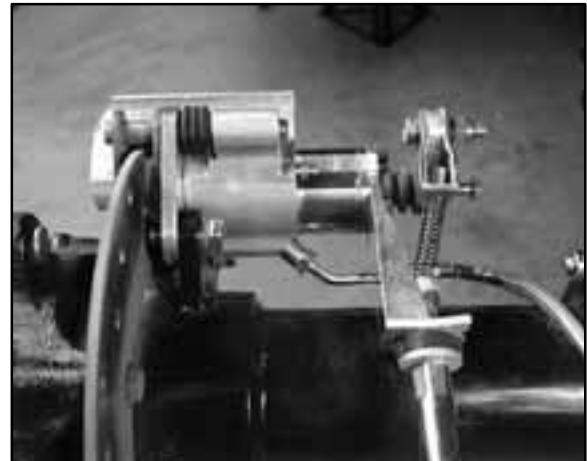


Rear Coil Over Shock Bolt Torque
25 ft. lbs. (35 Nm)

11. Reinstall the vent hose and clamp to the rear gearcase housing.
12. Apply anti-seize to the splines of the axle. Reinstall the hub onto the axle. Reinstall the domed washer, and spindle nut onto the axle.



13. Install the brake caliper. Torque the bolts to 18 ft. lbs. (24.8 Nm).



- 14.

Brake Caliper Torque:
18 ft. lbs. (24.8 Nm)



15. Install the tire and four wheel nuts. Torque the castle nut and the wheel nuts to specifications.



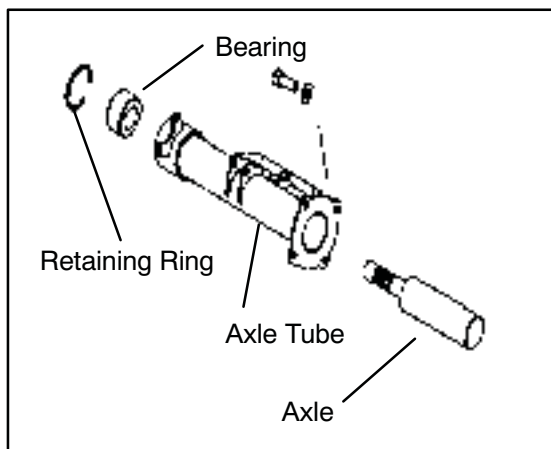
**Rear Spindle Nut Torque
110 ft. lbs. (149 Nm)**

**Rear Wheel Nut Torque
35 ft. lbs. (47 Nm)**

16. Install a new cotter pin. Tighten nut slightly to align holes if required. Install the hub cap.

REAR AXLE BEARING REMOVAL/INSTALLATION

1. For rear axle bearing removal, see Page 7.44 .

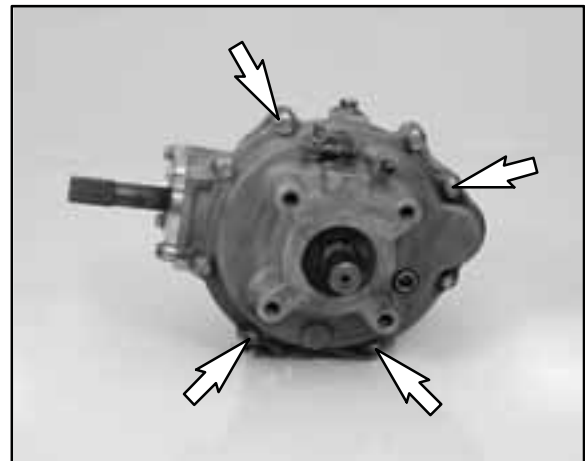


REAR DIFFERENTIAL REMOVAL

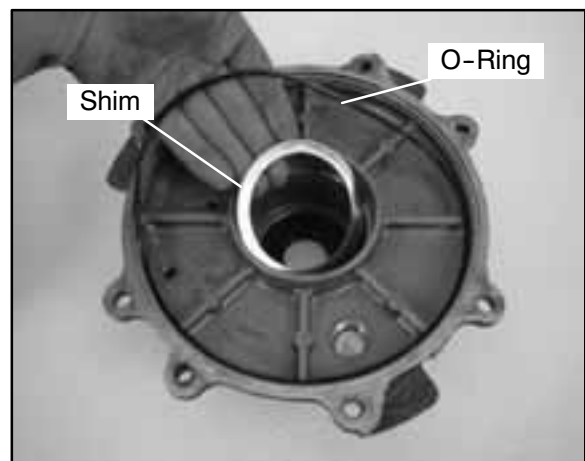
1. Refer to Steps 1-17 in the REAR DIFFERENTIAL REMOVAL/INSPECTION section on Page 7.41-7.43 for the removal of the rear gearcase.

REAR DIFFERENTIAL DISASSEMBLY (2X4 & 4X4)

1. Drain and properly dispose of used oil.

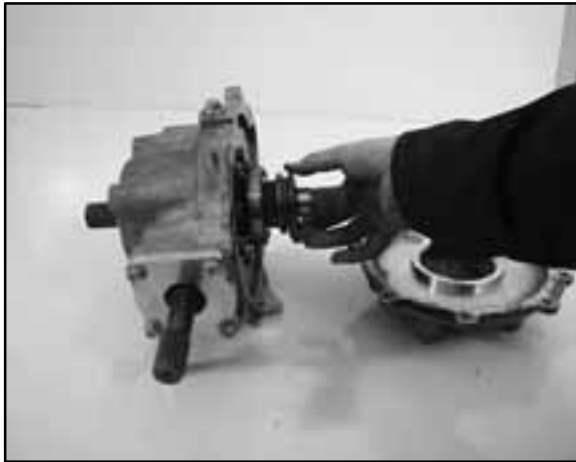


2. Remove the gearcase housing cover bolts and the differential housing cover.
3. Remove the shim and O-ring from the housing cover.

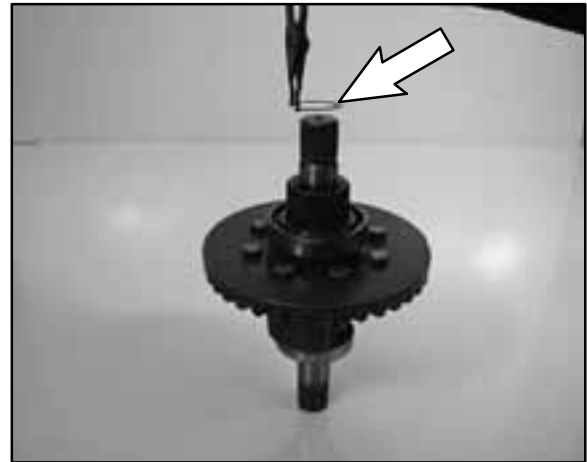




4. Remove the shift dog from the output shaft.



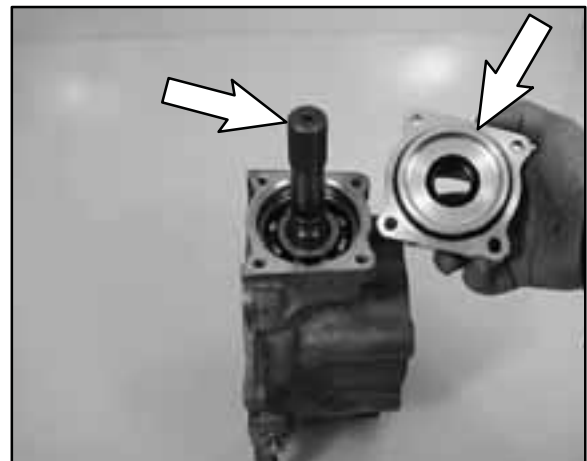
6. Remove retaining ring and the shim from the ring gear.



5. Remove the ring gear from the differential housing cover. Inspect the ring gear for abnormal wear, broken, or chipped teeth.



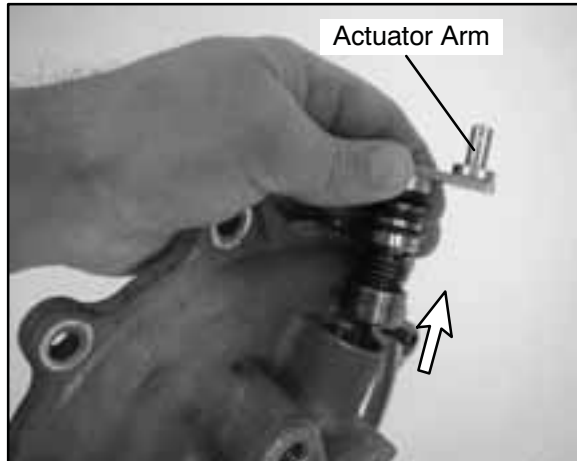
7. Remove the pinion gear cover and the pinion shaft from the differential housing. Inspect the ring gear for abnormal wear, broken, or chipped teeth.





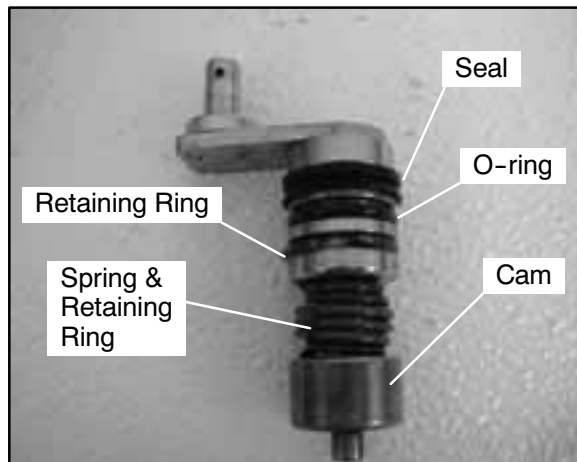
Rear Differential Actuator Removal

- With two small prybars or suitable tools, pry up and outward on the actuator arm. Lift the actuator arm out of the differential cover. A retaining ring secures the actuator assembly in the differential cover.



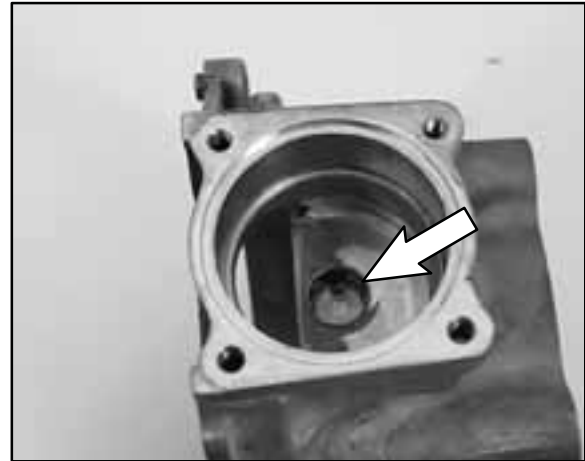
- Inspect the actuator assembly and replace parts as needed. Refer to your parts manual for new parts.

NOTE: The actuator assembly can be taken apart, refer to the exploded view at the end of this section for a parts breakdown.

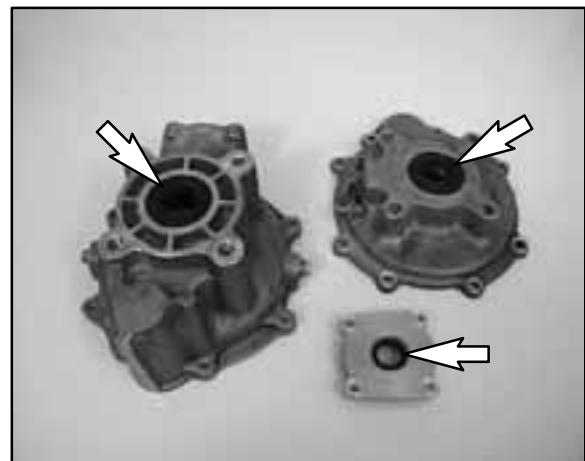


REAR DIFFERENTIAL ASSEMBLY (2X4 & 4X4)

- Inspect the pinion shaft bushing for wear.

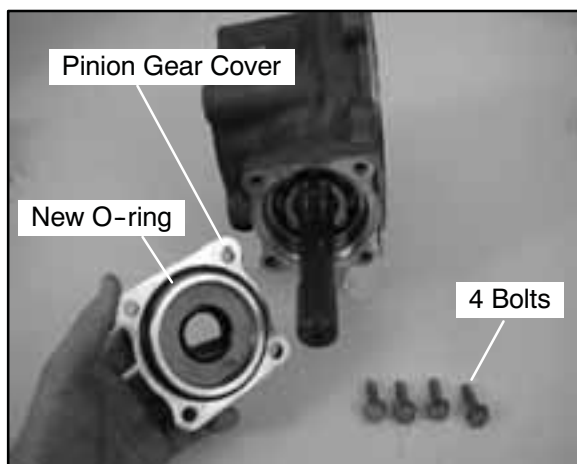
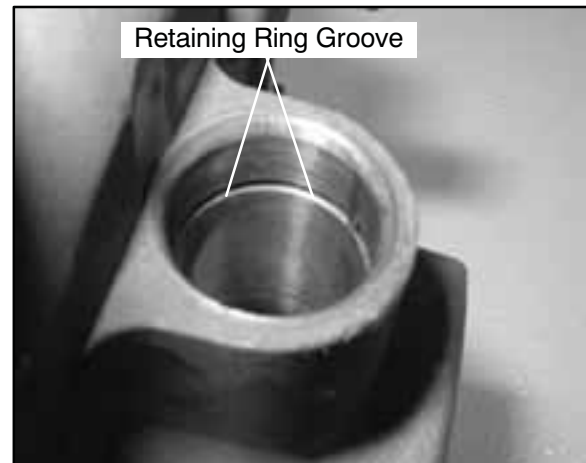


- Replace all O-rings, seals, and worn components.





3. Install the pinion shaft into the differential housing. Install a new O-ring onto the pinion shaft cover. Install the cover and torque the cover bolts to 20 ft. lbs. (27 Nm).



5. Reinstall the the original shims and snap ring onto the output shaft.

Pinion Shaft Cover Bolt Torque:

20 ft. lbs. (27 Nm)

4. Install a **NEW** seal, O-ring, and retaining ring onto the actuator if the actuator was removed. Install the actuator into the differential housing. Be sure the retaining ring fully seats into the groove in the differential cover.



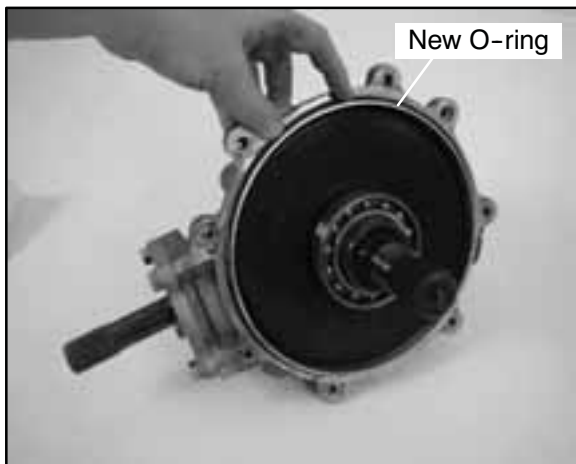


6. Install the ring gear into the differential housing.

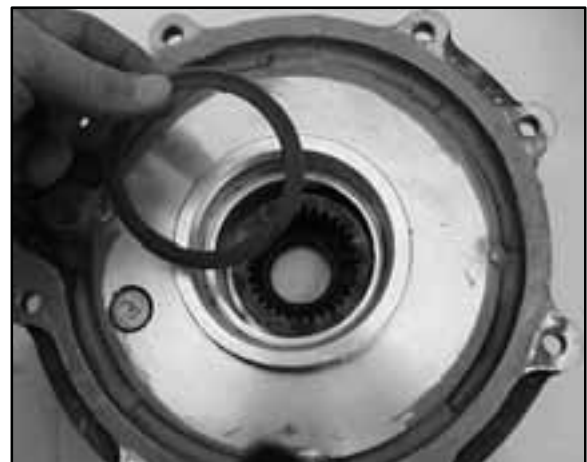


7. Install a new O-ring onto the lip of the gearcase housing.

NOTE: The O-ring is a smaller diameter than the gearcase. Use two hands to work the O-ring onto the gearcase lip.



9. Lubricate the shim with grease and place the shim in the differential housing cover.



8. Install the shift dog into the differential housing cover. The shift lever arm fits into the groove of the shift dog.

10. Carefully place the differential housing cover onto the gearcase housing. Slide the shift dog over the output shaft.

NOTE: Be sure the shift dog does not slide out of place during assembly of the gearcase halves.



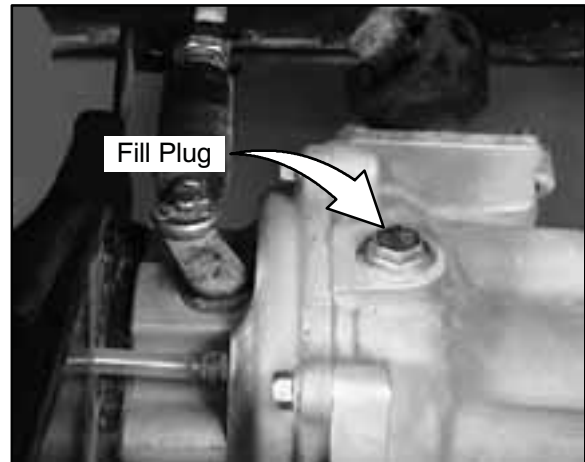
11. Torque the cover bolts to 20 ft. lbs. (27 Nm) in a criss cross pattern.



Cover Bolts Torque

20 ft. lbs. (27 Nm)

correct specs. Check drain plug for proper torque.



Fill Plug Bolt Torque: 14 ft. lbs. (19 Nm)

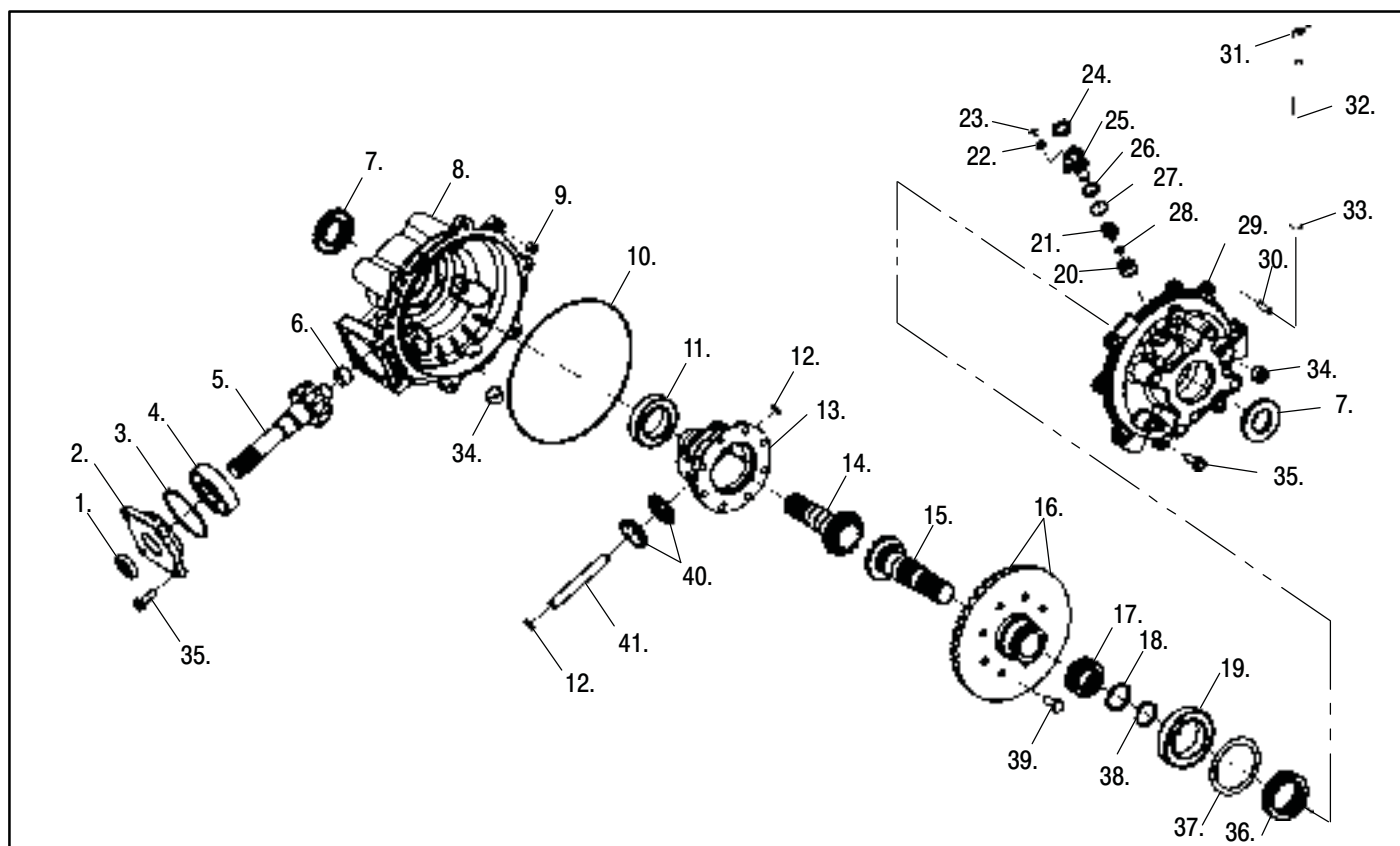
**Rear Gearcase Capacity:
10.0 fl. oz. (300 ml)**

REAR DIFFERENTIAL INSTALLATION

1. Refer to the REAR AXLE HOUSING INSTALLATION section on Pages 7.44–7.45 for the installation of the rear gearcase and axle.
2. Add Polaris Premium Gearcase Lubricant (**PN 2871477**) to rear gearcase. Refer to Chapter 2 for



REAR DIFFERENTIAL EXPLODED VIEW (2X4 & 4X4)



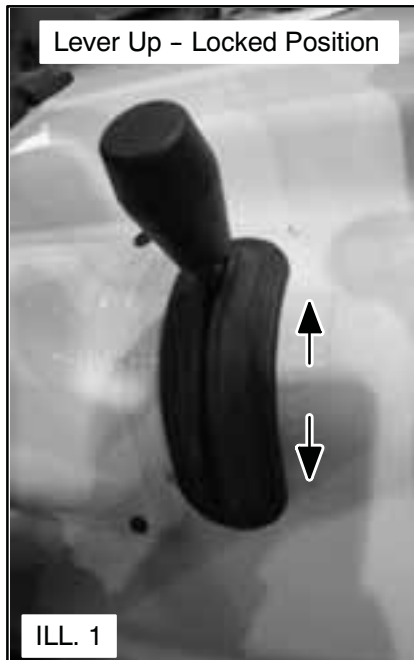
Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Rear Gearcase	22.	1	Spring, Torsion
1.	1	Seal	23.	1	Washer
2.	1	Cover, Input	24.	1	Pin, Clip
3.	1	O-Ring	25.	1	Seal
4.	1	Bearing, Ball	26.	1	Actuator
5.	1	Pinion, 10T	27.	1	O-Ring
6.	1	Bushing	28.	1	Ring, Retaining
7.	2	Seal	29.	1	Ring, Retaining
8.	1	Case, Front	30.	1	Cover, Output
9.	1	Pipe, Knock	31.	1	Tube, Vent
10.	1	O-Ring	32.	3	Clip
11.	1	Bearing, Ball	33.	AR	Line, Vent
13.	2	Ring, Retaining	34.	1	Clamp, Hose
14.	1	Housing, Differential Lock	35.	2	Plug, Drain
15.	1	Gear, 14T, RH	36.	12	Screw
16.	1	Gear, 14T, LH	37.	1	Dog, Engagement
17.	1	Gear, Ring 37T	38.	AR	Shim
18.	1	Collar, Spined	39.	1	Ring, Retaining
19.	1	Washer, Thrust	40.	8	Screw, Cap
20.	1	Bearing, Ball	41.	2	Pinion, Differential, 10T
21.	1	Actuator, Cam	42.	1	Pin, Differential Pinion



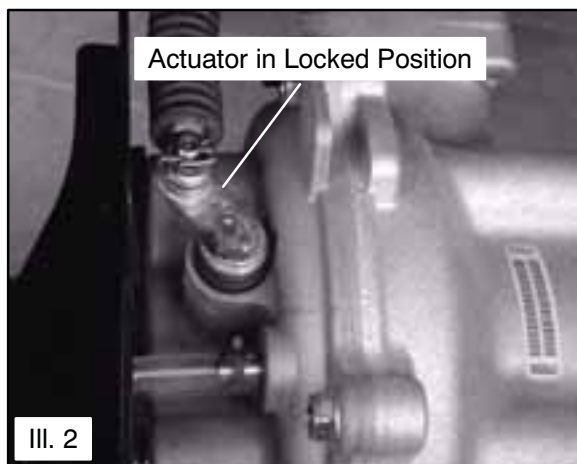
REAR DIFFERENTIAL OPERATION **(2x4 & 4x4)**

Differential in Locked Position

1. The rear differential can be in a locked position or an unlocked position. To lock the differential push up on the lever on the dash. To unlock the rear differential pull down on the lever. Illustration 1 shows the lever up and the differential in the locked position.

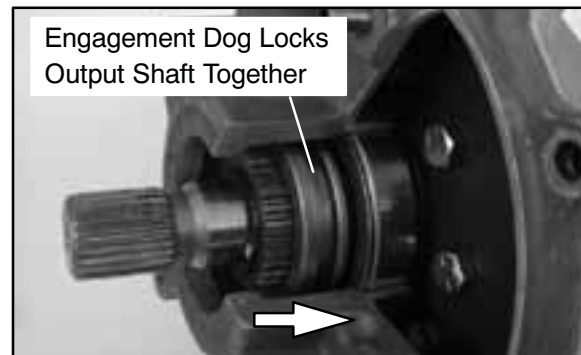


2. Illustration 2 shows the actuator on the rear differential in the locked position.

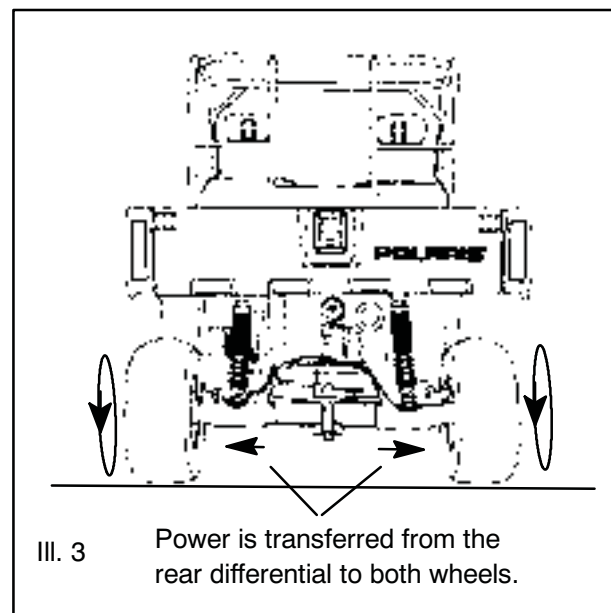


NOTE: The pictures below show a cutaway view of the rear differential for display purposes only.

When the rear differential is in the locked position the actuator has the engagement dog in place so the two output shafts are locked into position to form a single axle.



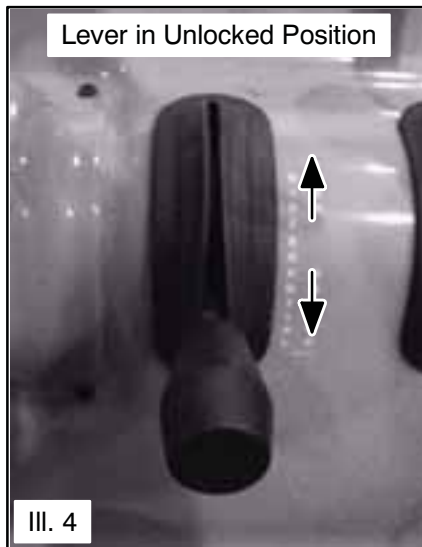
3. Illustration 3 shows the rear differential in the locked position. When the differential is locked power is going to both wheels and acts as a solid axle. **NOTE:** The locked differential is not recommended when driving on turf.



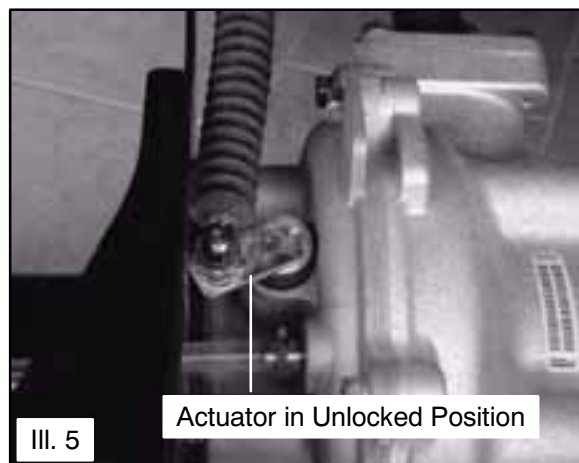


Differential in Unlocked Position

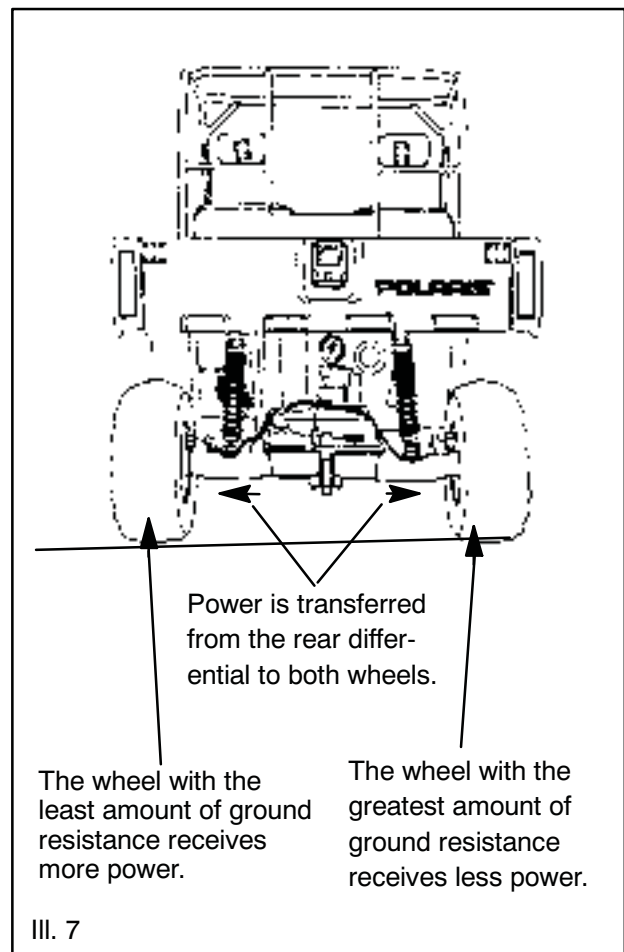
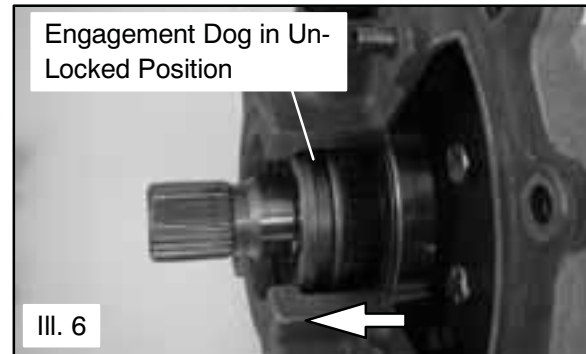
4. Illustration 4 shows the lever down. The rear differential is now in the unlocked position.



5. Illustration 5 shows the actuator on the rear differential in the unlocked position.



6. Illustration 6 - When the rear differential is in the unlocked position the actuator slides the engagement dog into place so the output shafts are unlocked, to form an open differential rear axle assembly. An example of how the limited slip operation works is shown in Illustration 7.



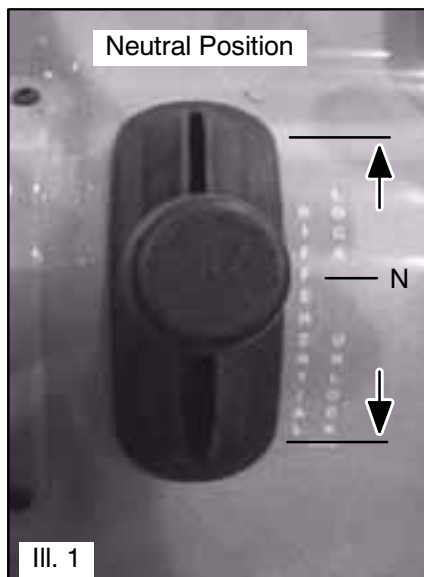


REAR DIFFERENTIAL LINKAGE INSPECTION/ADJUSTMENT

Rear Differential Linkage rod adjustment is necessary when symptoms include:

- The rear differential does not go into the "Locked Position"
- The rear differential does not go into the "Unlocked Position"
- Excessive gear clash (Continuous clicking noise caused by the differential not being properly engaged)
- Differential selector moves out of desired position

1. Inspect linkage cable, clevis pins, and pivot bushings and replace if worn or damaged.
2. Place differential lock lever in a neutral position, centered between the Lock and Unlocked positions (III. 1).

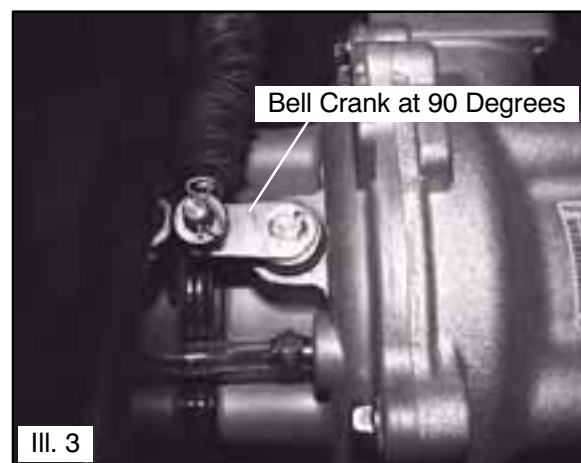


3. With two wrenches loosen the jam nuts and back both of the jam nuts off (III. 2).



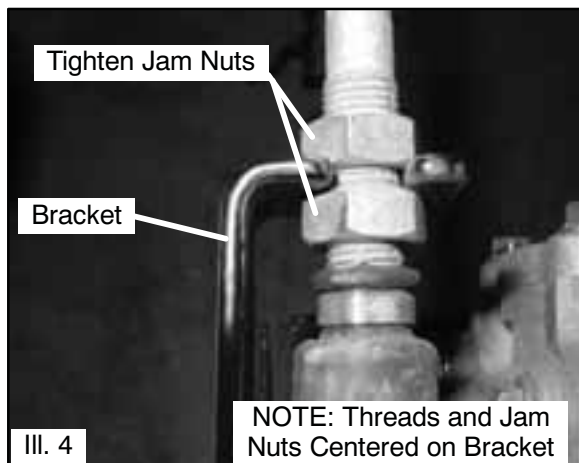
4. Move the rear differential bell crank to 90 degrees (inline with the axle) (III. 3).

NOTE: Before you tighten the jam nuts in Step 5, be sure the differential lock lever is in the neutral position (Step1).

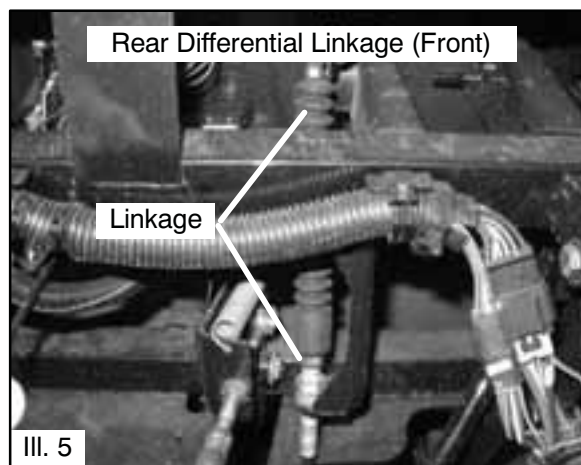


5. Hold the bellcrank in the 90 degree position. Hand tighten the jam nuts to the mounting bracket.

NOTE: If replacing the rear differential cable, it is advisable to have the threads and jam nuts centered on the mounting brackets. This will ease any future differential cable adjustments for the user.

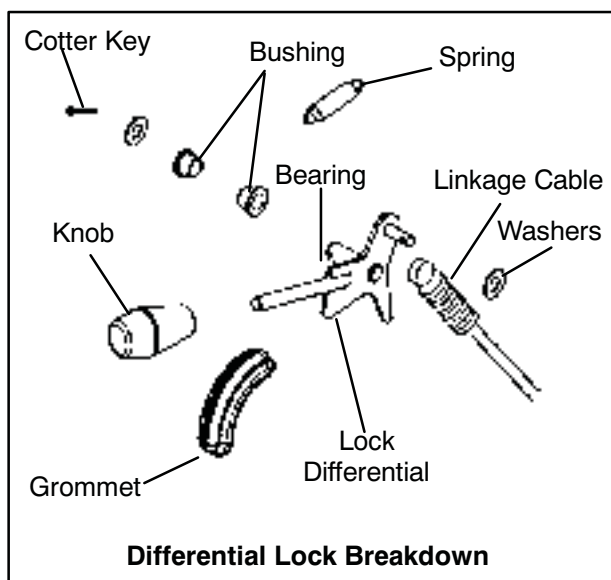
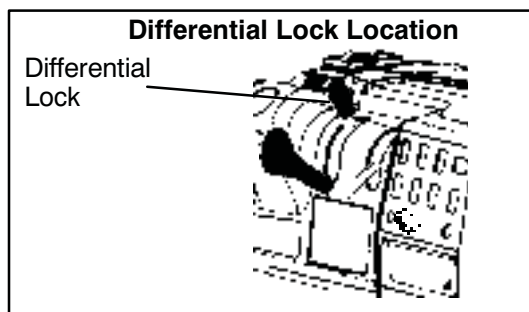


6. If the adjustment of the linkage on the rear differential (Steps 1-5) does not work. Repeat these steps on the linkage located under the front hood. This linkage is closely attached to the rear differential lever.



DIFFERENTIAL LOCK LEVER REMOVAL/INSTALLATION (2X4 & 4X4)

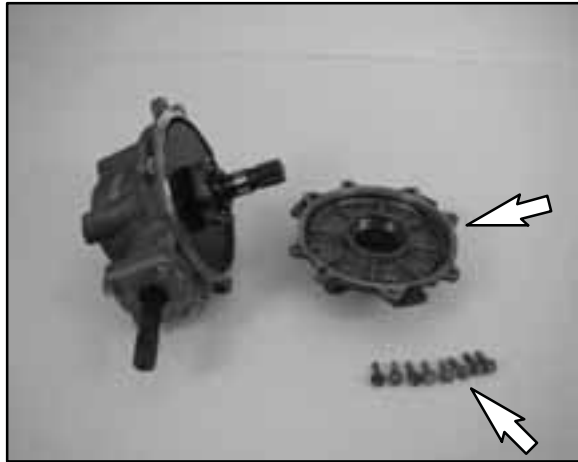
1. Disconnect linkage cable from lock differential.
2. Remove the cotter key, washers and bushings that attach lock differential to the cable and frame.
3. Pull off the shifter knob.
4. Lift lock differential out of mounting bracket and away from frame.
5. Repeat the steps above in reverse order for the differential lock lever installation.



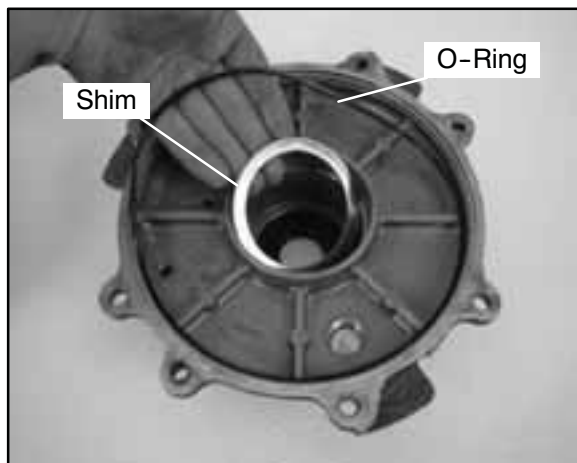


REAR DIFFERENTIAL DISASSEMBLY (6X6)

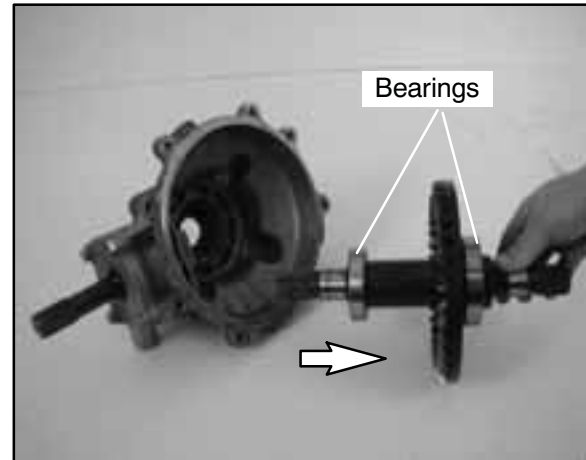
1. Drain and properly dispose of used oil.
2. Remove the differential housing cover bolts and the gearcase housing cover.



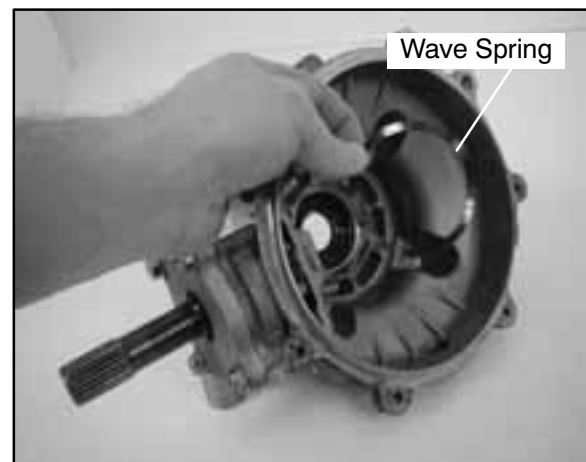
3. Remove the shim and O-ring from the differential cover.



4. Remove the output shaft and ring gear from the differential. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Inspect the bearings for wear. Spin the bearings by hand, the bearings should roll smoothly. Replace the bearings if needed.

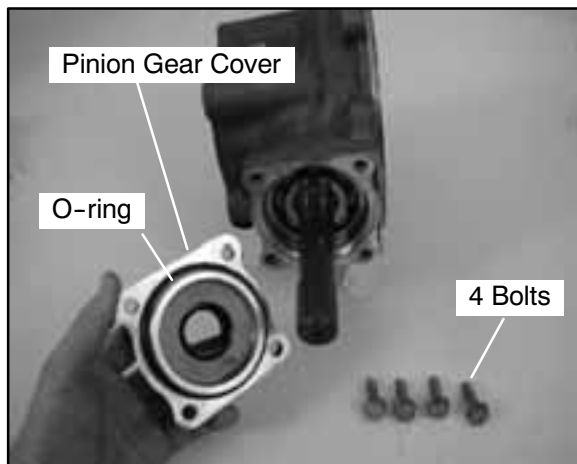


5. Remove the wave spring from the differential assembly.

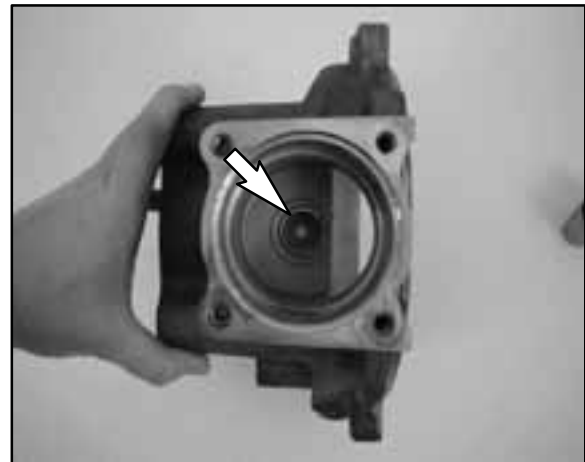




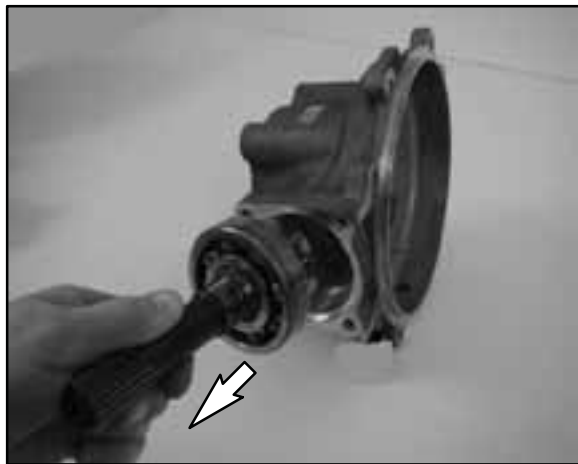
6. Remove the four bolts that secure the pinion gear cover to the differential. Remove the pinion gear cover and O-ring.



8. Inspect the pinion shaft bushing for wear.

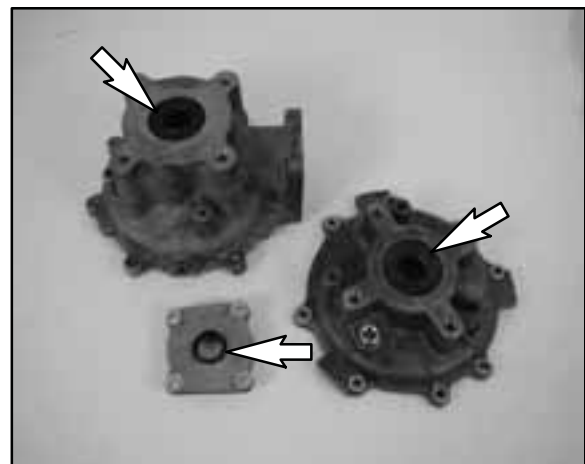


7. Remove the pinion shaft from the differential. Inspect for abnormal wear, broken, or chipped teeth.



REAR DIFFERENTIAL ASSEMBLY (6X6)

1. Replace all O-rings, seals, and worn components.

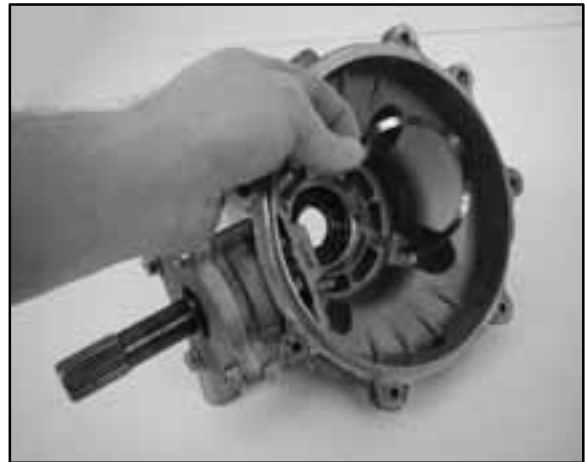




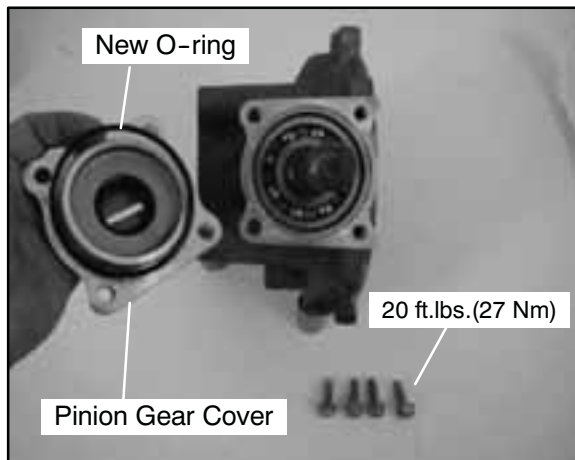
2. Install the pinion shaft into the differential housing.



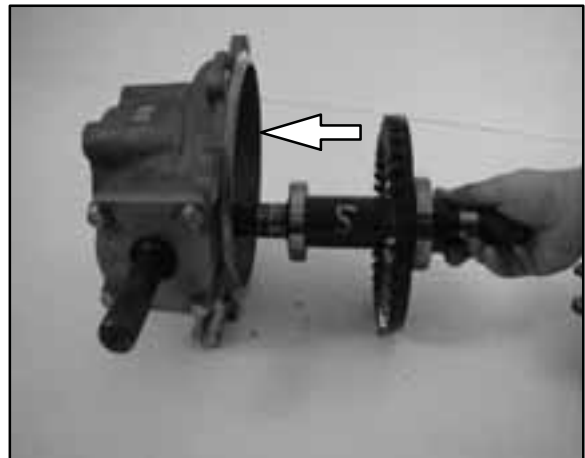
4. Install the wave spring into the differential assembly. Be sure to properly seat the wave spring into the differential.



3. Replace the pinion shaft cover O-ring and install the cover. Install the four pinion shaft cover bolts and torque the bolts to 20 ft. lbs. (27 Nm).



5. Reinstall the the output shaft and ring gear.



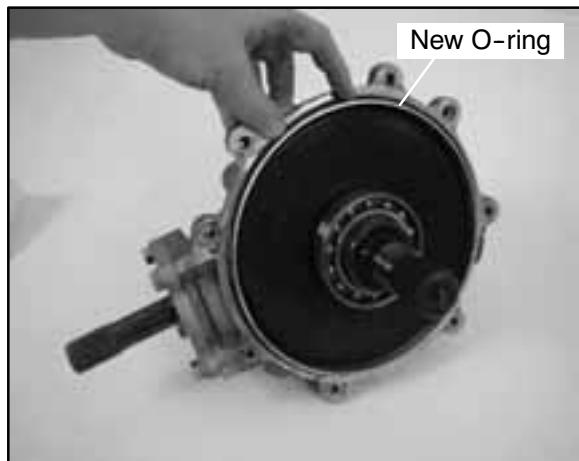
Pinion Shaft Cover Bolt Torque:

20 ft. lbs. (27 Nm)

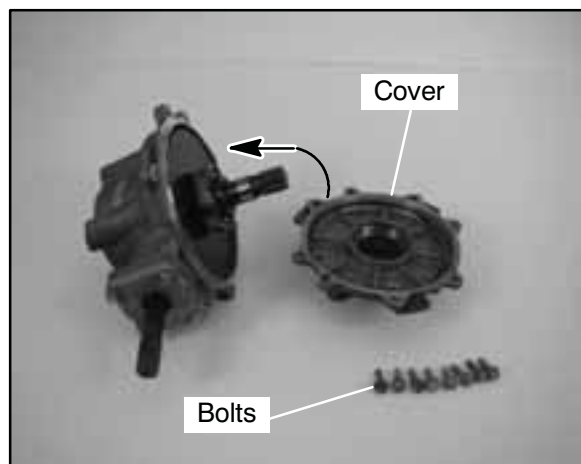


6. Install a new O-ring onto the lip of the gearcase housing.

NOTE: The O-ring is a smaller diameter than the gearcase. Use two hands to work the O-ring onto the gearcase lip.



7. Install the output cover onto the differential assembly.
8. The output cover must be properly aligned and installed straight with the differential when installed. This will ensure that the O-ring is not damaged during output cover installation. This also helps to prevent any gearcase leaks after assembly.



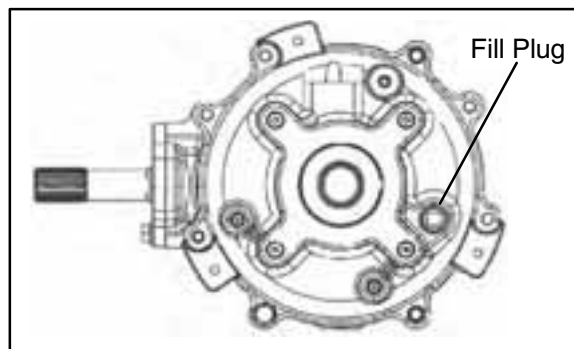
9. Torque the output cover bolts to 20 ft. lbs. (27 Nm).

Output Cover Bolt Torque

20 ft. lbs. (27 Nm)

REAR DIFFERENTIAL INSTALLATION

1. Refer to the REAR AXLE HOUSING INSTALLATION section on Pages 7.44–7.45 for the installation of the rear gearcase and axle.
2. Add Polaris Premium Synthetic Gearcase Lubricant (**PN 2871447**) to rear gearcase. Torque the drain plug to 14 ft. lbs. (19 Nm).



Fill Plug Bolt Torque

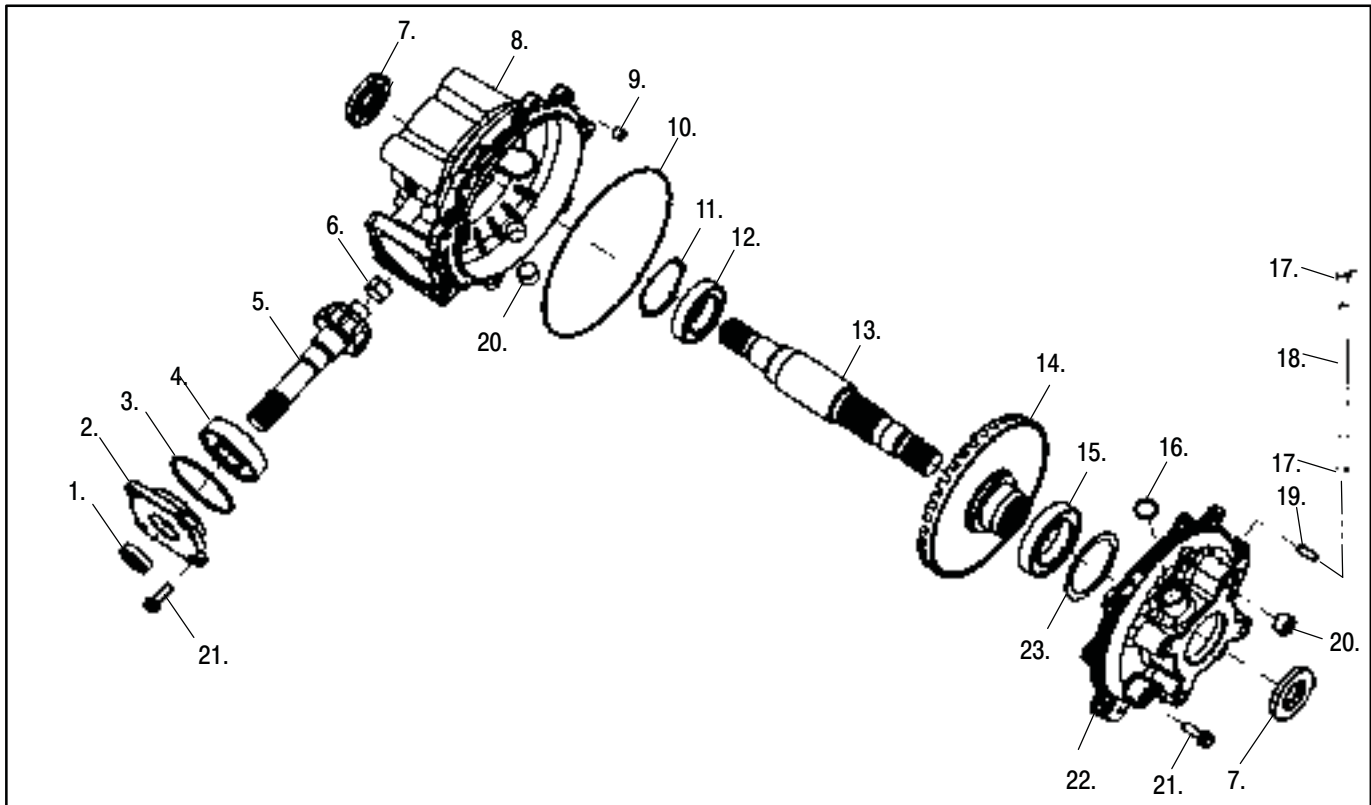
14 ft. lbs. (19 Nm)

Rear Gearcase Capacity

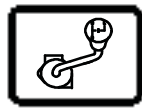
10.0 fl. oz. (300 ml)



REAR DIFFERENTIAL EXPLODED VIEW (6X6)



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Rear Gearcase	12.	1	Bearing, Ball
1.	1	Seal	13.	1	Shaft, Output
2.	1	Cover, Input	14.	1	Gear, Ring 37T
3.	1	O-Ring	15.	1	Bearing, Ball
4.	1	Bearing, Ball	16.	1	Plug, Expansion
5.	1	Pinion, 10T	17.	3	Clip
6.	1	Bushing	18.	AR	Line, Vent
7.	2	Seal	19.	1	Tube, Vent
8.	1	Case, Front	20.	2	Plug, Drain
9.	1	Pipe, Knock	21.	12	Screw
10.	1	O-Ring	22.	1	Cover, Output
11.	1	Spring, Wave	23.	AR	Shim 2.5



CHAPTER 8

TRANSMISSION SERVICE

Torque Specifications/Lubrication	8.2
Gear Shift Selector Removal/Installation	8.2
Shift Linkage Adjustment	8.2-8.3
Transmission Removal	8.3-8.5
Transmission Installation	8.6
Transmission Disassembly	8.7-8.13
Transmission Assembly	8.13-8.18
Troubleshooting	8.18
2x4 Transmission, Exploded	8.19-8.20
4x4 & 6x6 Transmission, Exploded	8.21-8.22

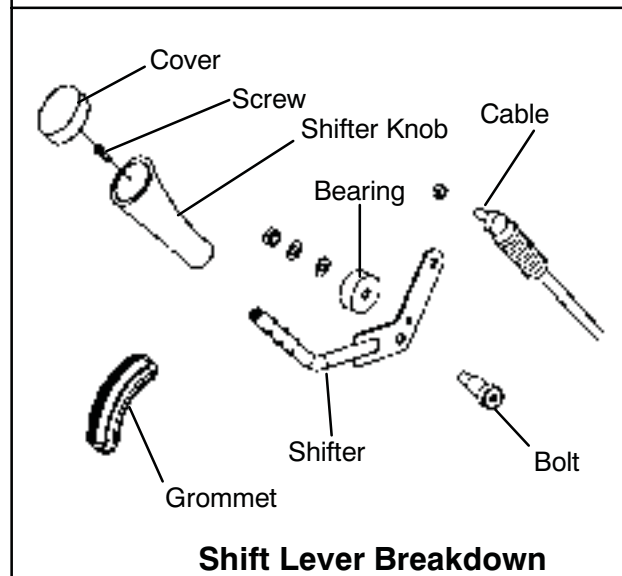
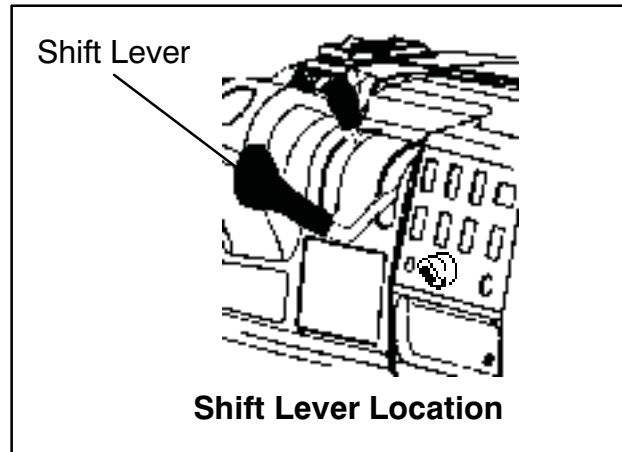


TORQUE SPECIFICATIONS

Transmission Case Bolts	20 ft. lbs. (27 Nm)
Bell Crank Nut	15 ft. lbs. (20 Nm)
Transmission Drain Plug	14 ft. lbs. (19 Nm)
Transmission Fill Plug	14 ft. lbs. (19 Nm)
Transmission Mounting Bolts . .	25 ft. lbs. (35 Nm)

SHIFT LEVER REMOVAL/INSTALLATION

1. Disconnect linkage cable from shifter.
2. Remove one bolt attaching gear selector mount to machine frame.
3. Remove the cover and remove screw. Pull off the shifter knob.
4. Lift gear selector out of mounting bracket and away from frame.
5. Repeat the steps in reverse order to install the gear selector.



SHIFT LINKAGE INSPECTION/ADJUSTMENT

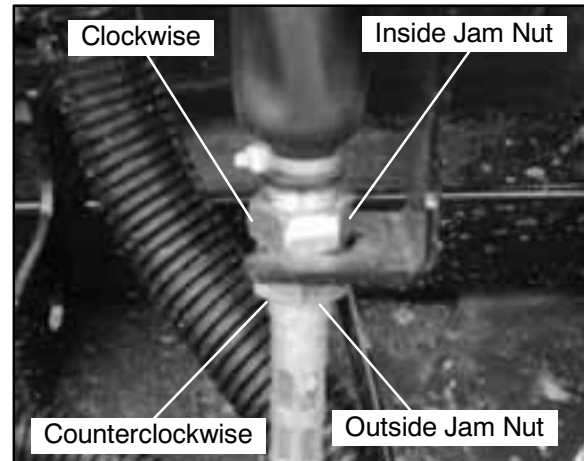
Linkage rod adjustment is necessary when symptoms include:

- No All Wheel Drive light
- Noise on deceleration
- Inability to engage a gear
- Excessive gear clash (noise)
- Shift selectors moving out of desired range

NOTE: Remove necessary components to gain access to shift linkage cable ends (i.e. exhaust heat shield, exhaust pipe, etc.).



1. Inspect shift linkage cable, clevis pins, and pivot bushings and replace if worn or damaged.
2. Be sure idle speed is adjusted properly.
3. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.



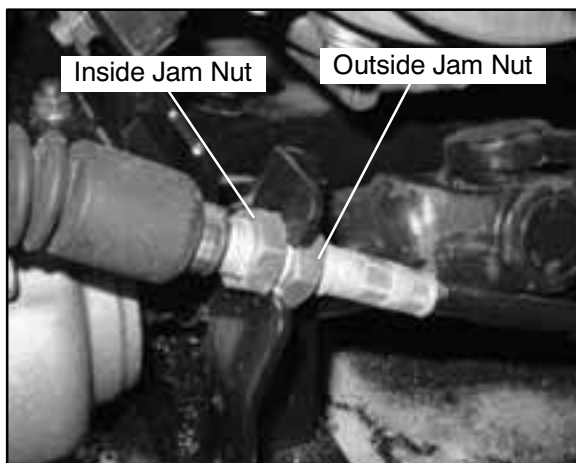
Shift Lever Cable Adjustment

TRANSMISSION REMOVAL

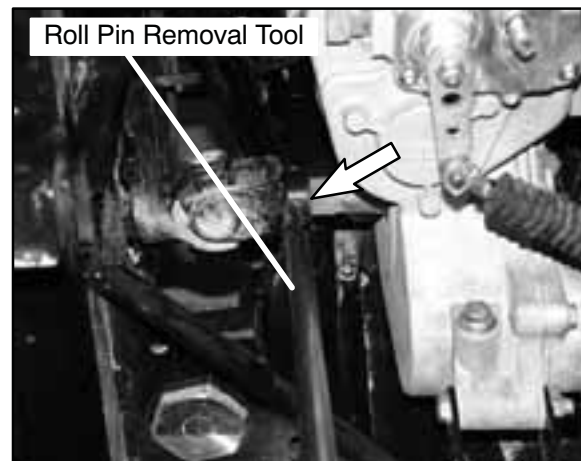
4. With two wrenches loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns. Perform this procedure on the shift lever end, also.

1. Remove the PVT system from the left side of the transmission.
2. Drive roll pin from rear driveshaft yoke.

NOTE: On the 4x4 & 6x6 transmission the front output shaft yolk slides off during the transmission removal.



Transmission Cable Adjustment



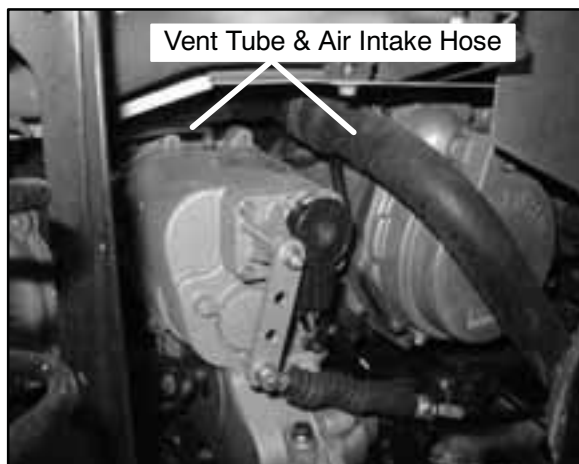
Roll Pin Removal Tool (PN 2872608)

5. After turning the outside jam nut 1 1/2 turns. Hold the outside jam nut with a wrench and tighten the inside jam nut clockwise, until it is tight against the bracket.
6. Repeat Step 4 and Step 5 until the proper adjustment is made for the transmission cable.
7. Use this procedure to loosen or tighten the shift linkage cable as needed.

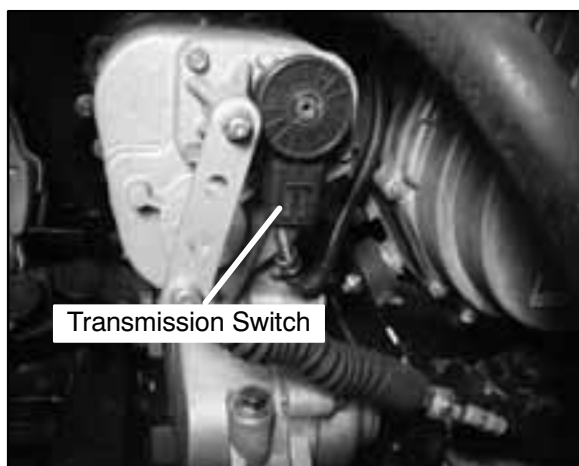
3. Remove the air intake hose from the air box that is located above the transmission. Place the hose to the side, this eases the transmission removal. Remove the vent hose from the top of the



transmission.



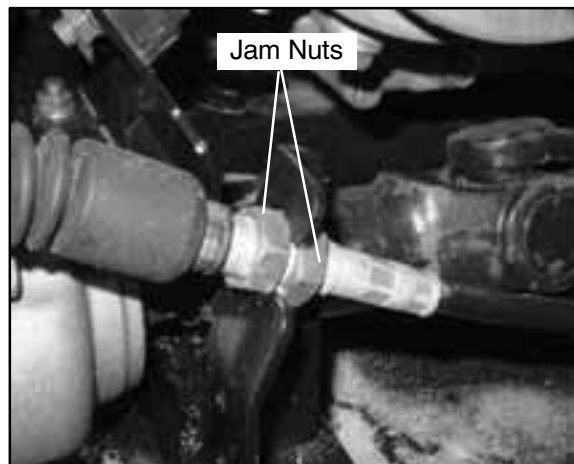
4. Disconnect the transmission switch.



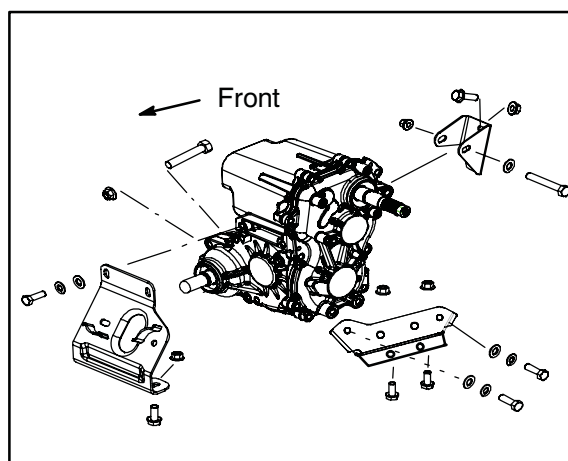
5. Remove the cotter pin from the shift linkage rod. Remove the shift linkage rod and a washer from the bellcrank.



6. Loosen the jam nuts for the transmission cable. Remove the cable from the mounting bracket.



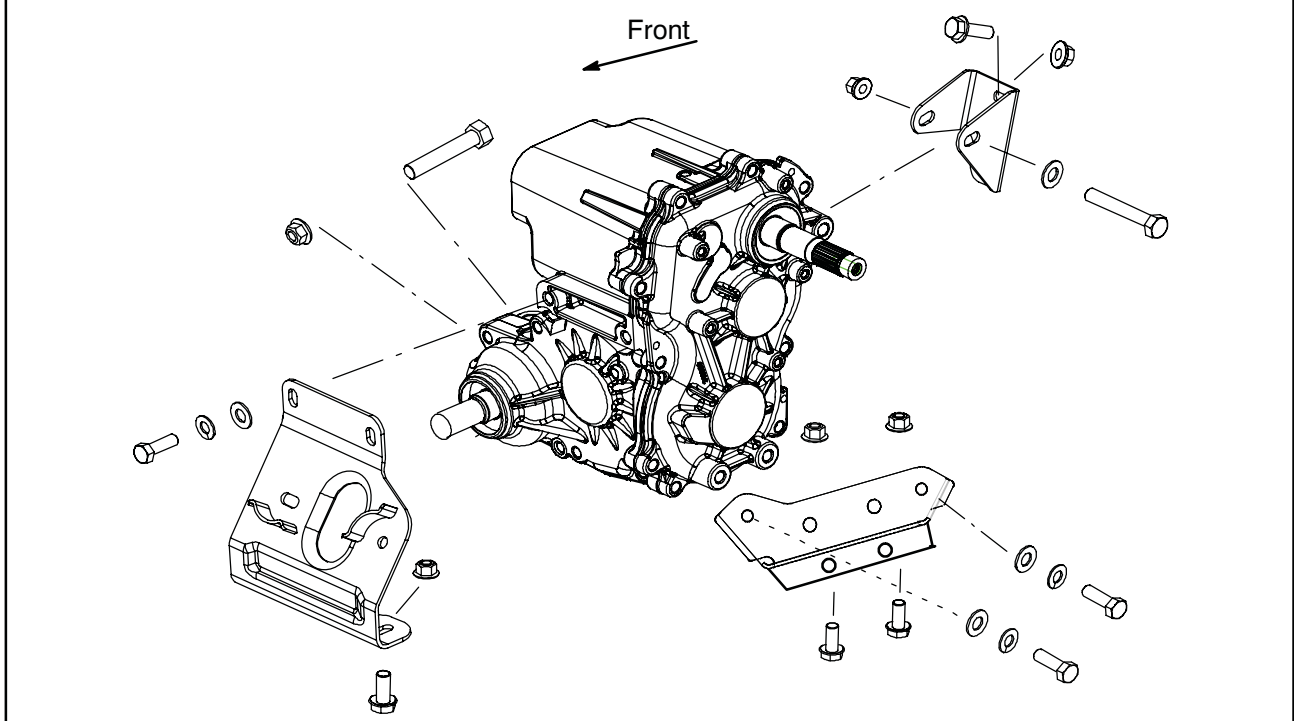
7. Remove the mounting bolts from the transmission mounting on both sides of the transmission.





8. Remove the four bottom transmission to frame bolts.
9. Remove the rear transmission to frame bolt.
10. Remove front transmission-to-engine mount bolt.

General Transmission Mounting



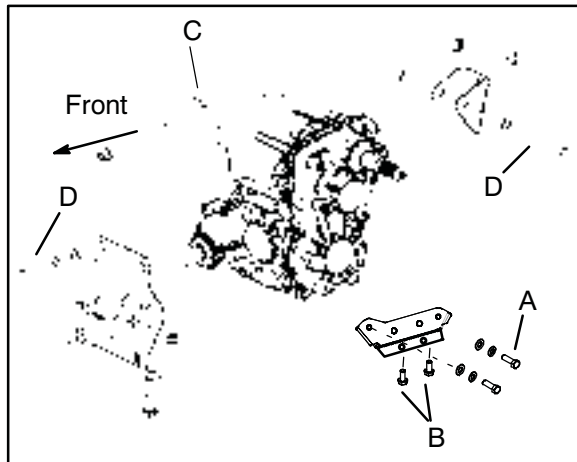
11. Remove transmission from right side of frame.





TRANSMISSION INSTALLATION

1. Install transmission from right side of vehicle.
2. Position transmission in frame.
3. Loosely install the front transmission to frame bolts.
4. Loosely install the rear transmission to frame bolt.
5. Loosely install the three bottom transmission to frame bolts.
6. Tighten mounting fasteners in order A-D as shown.



Transmission Mounting Bolts Torque

25 ft. lbs. (34.5 Nm)

NOTE: Be sure to tighten the lower transmission bolts first, this ensures that the transmission is tight against the lower frame and helps to properly align the transmission.

NOTE: Align clutches as outlined in Clutch Chapter 6.

7. Align the front input shaft to the front propshaft yoke on the vehicle.
8. Align rear output shaft to rear propshaft yoke and roll pin hole.
9. Slide rear output shaft and into propshaft yoke. Drive the roll pin into the driveshaft yolk.
10. Reinstall the shift linkage rod, the air intake hose, and the vent hose on top of the transmission.



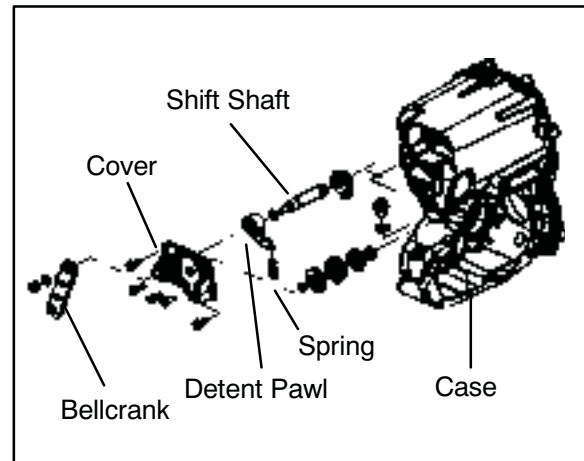
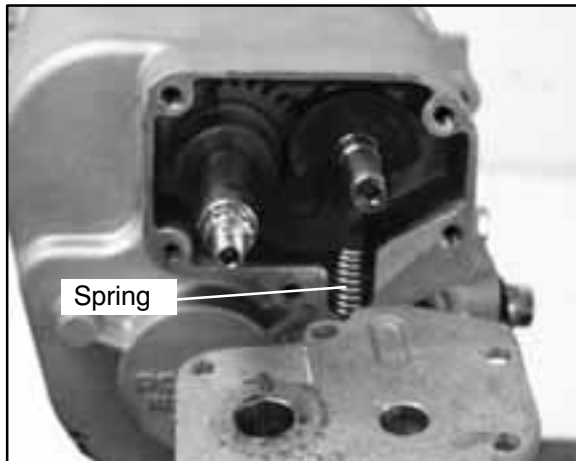
TRANSMISSION DISASSEMBLY

NOTE: The following disassembly procedure shows the 4x4 transmission disassembly. Follow the same procedure for the 2x4 and 6x6 transmission disassembly. The transmissions are very similar. Refer to the exploded views at the end of this chapter.

1. Place the bellcrank in neutral position.
2. Remove the nut, and washer that secure the bell crank. Remove the bellcrank.

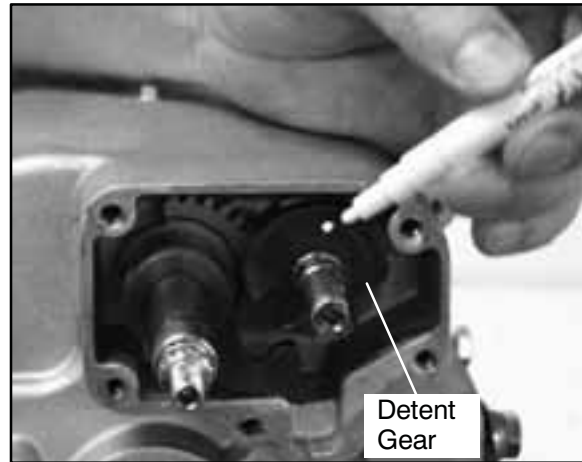


3. Remove the five bolts that secure the cover. Remove the detent spring.



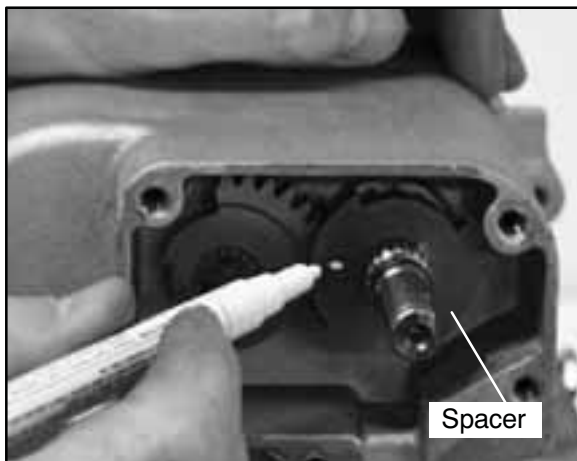
4. Mark the detent gear with a white pen. Remove the detent gear from the case.

NOTE: It may be helpful to place a mark just above the keyed spline.



5. Mark the spacer, this will indicate which side of the disc faces outward during assembly. Remove the spacer.

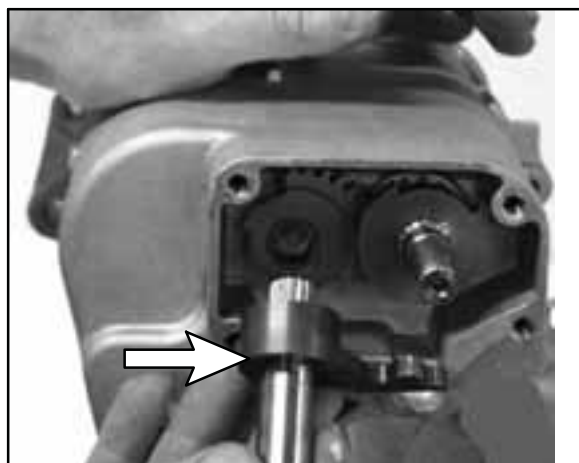
NOTE: It may be helpful to place a mark just above the keyed spline.



6. Remove the shift shaft and detent lever.

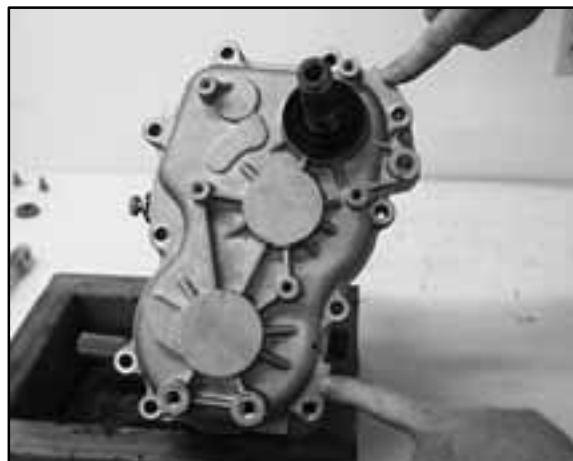


8. Remove the bolts on the LH transmission case. Tap the cover off with a soft face hammer if necessary.



7. Note the timing marks on the shift gears. Remove the shift gears from the case.

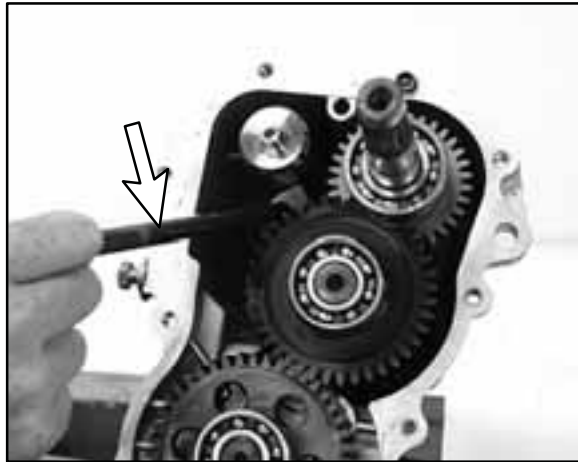
NOTE: It may be helpful to accent the timing marks using a white marking pen.



9. Lift shift rail 0.5-1" (12.70-25.40 mm). Then rotate the shift rail/forks and shift drum, so the the

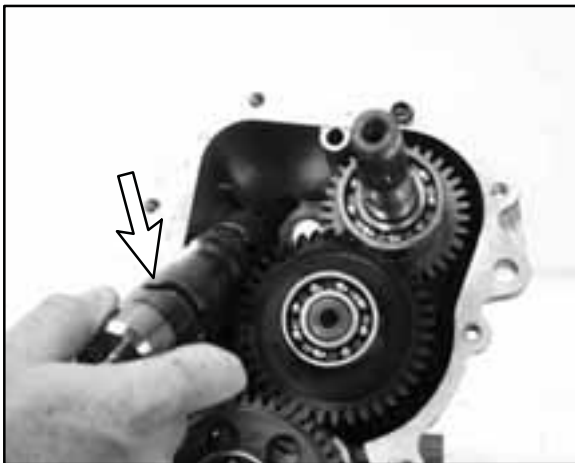


forks' pins disengage from the drum.



10. Remove the shift drum.

NOTE: You may have to tap the shift drum from the backside of the case to aid in removal.



11. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.



12. Set the upper gear cluster on a flat surface and inspect the components.

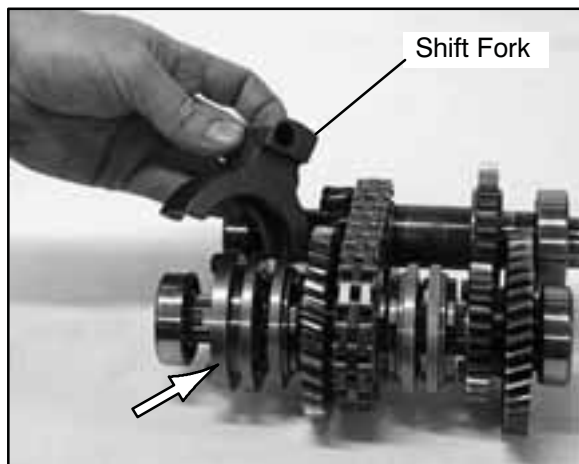


13. Remove the shift forks from the assembly. Note the correct position of each fork.

NOTE: The picture on the right depicts a transmission with a "park dog" on the end of the shaft instead of a regular "shift dog". The transmission will



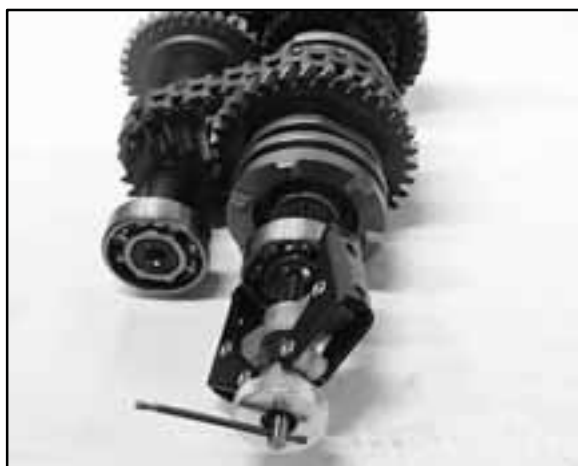
have a regular shift dog in the location indicated by the arrow in the photo.



14. Remove the bearing from the reverse shaft with a puller.



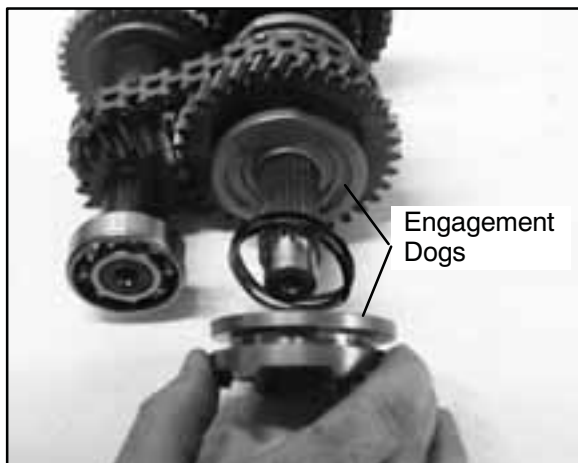
17. Remove the snap ring and washer from the reverse shaft.



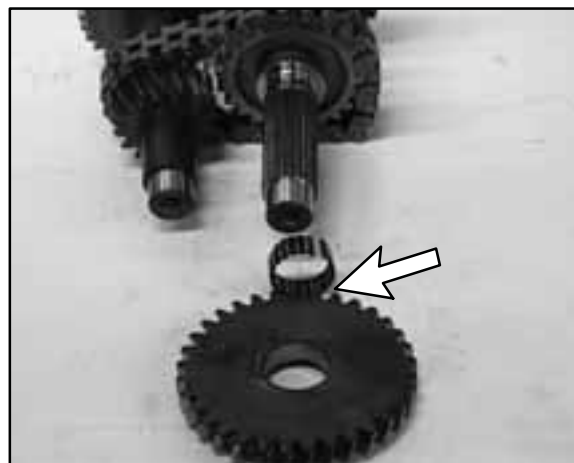
15. Remove the park lock engagement dog. Remove the wave spring and reverse engagement dog.



18. Remove low gear (33T) and the needle bearing.



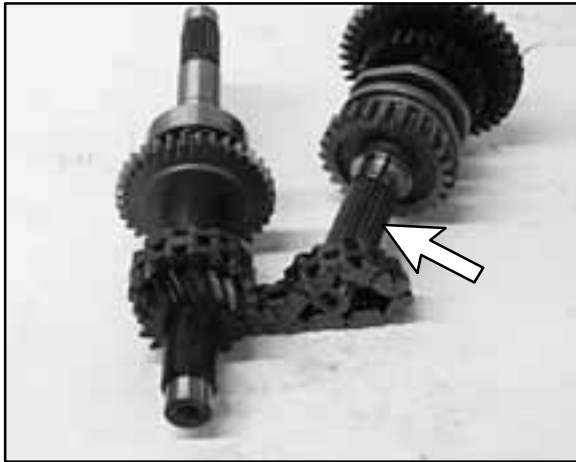
16. Remove the bearing from the input shaft with a puller.



19. Remove the reverse gear shaft.



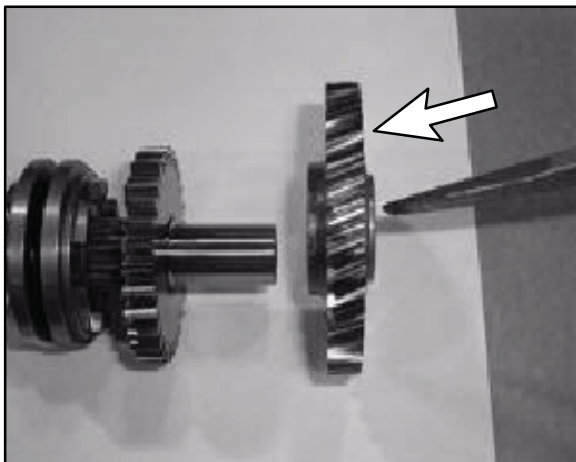
20. Remove the rest of the bearings from the shafts.



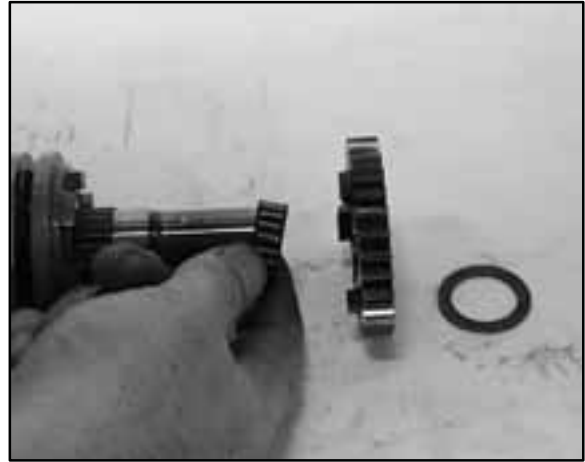
21. Use a press to remove the gear from the shaft.



22. Make note of the direction of the gear and hub location.



23. Remove the gear, split bearing, and washer from the reverse shaft.



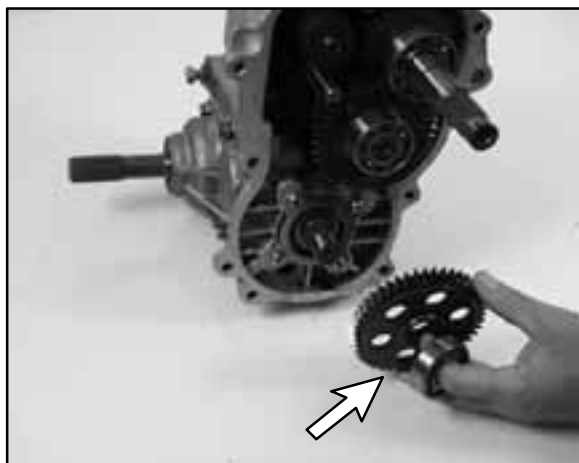
24. Slide off the shift dogs and wave springs.



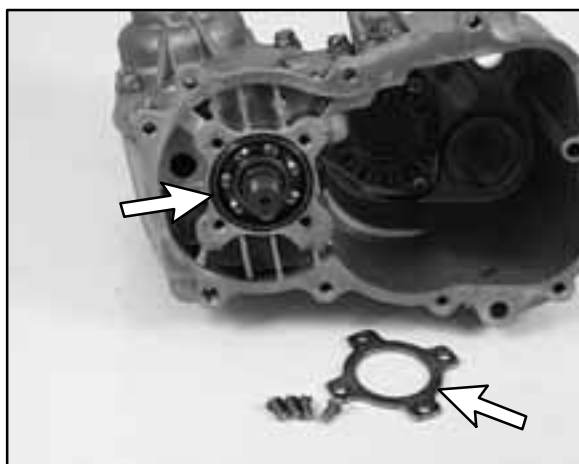
25. Remove the snap ring, washer, gear, and split bearing.



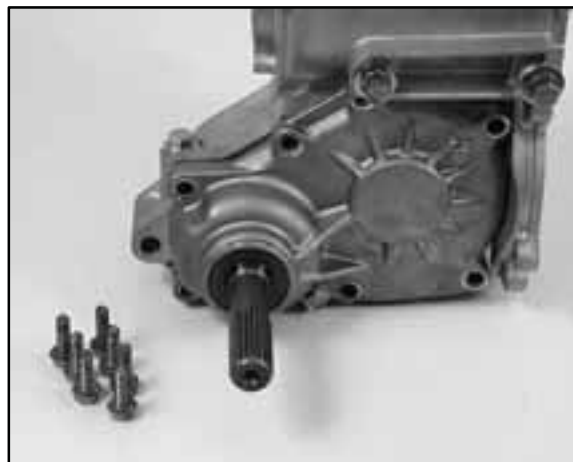
26. Remove bearing and the helical gear.



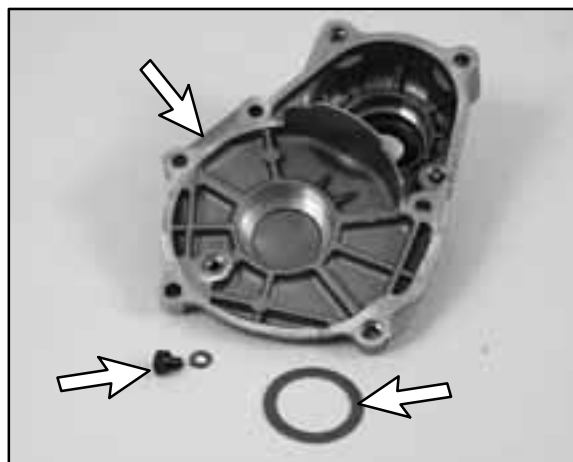
27. Remove the pinion shaft retainer plate and the pinion shaft.



28. Remove the front housing cover screws.

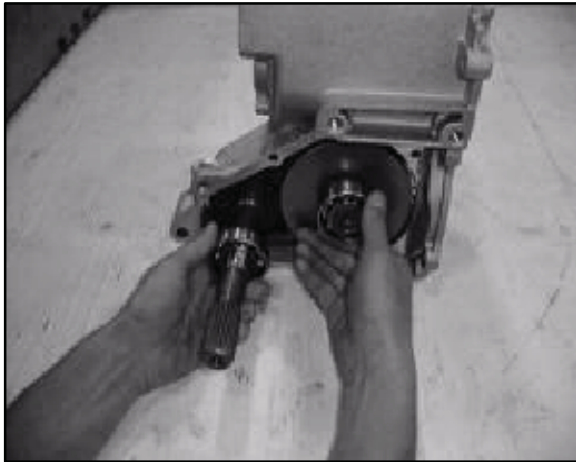


29. Remove the front housing cover, shim, thrust button, and thrust button shim.

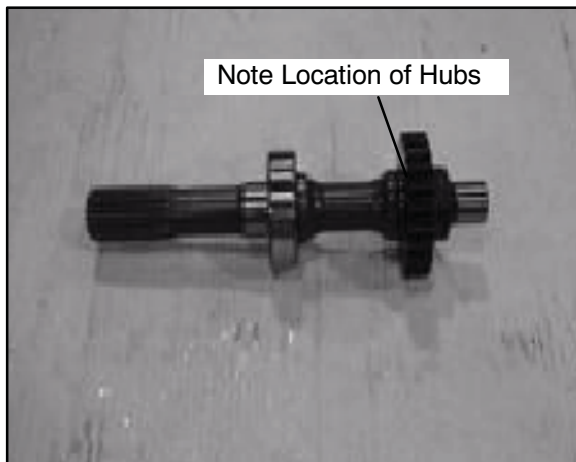




30. Remove the shafts as an assembly.



31. Remove the silent chain from the assembly for shaft inspection.
32. Clean all components in a parts washer and inspect for wear.
33. Inspect engagement dogs of gears and replace if edges are rounded.
34. Inspect gear teeth for wear, cracks, chips or broken teeth. Note the location of the hubs on the gear.



35. Remove seals from transmission case.
- IMPORTANT:** New seals should be installed after the transmission is completely assembled.
36. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

TRANSMISSION ASSEMBLY

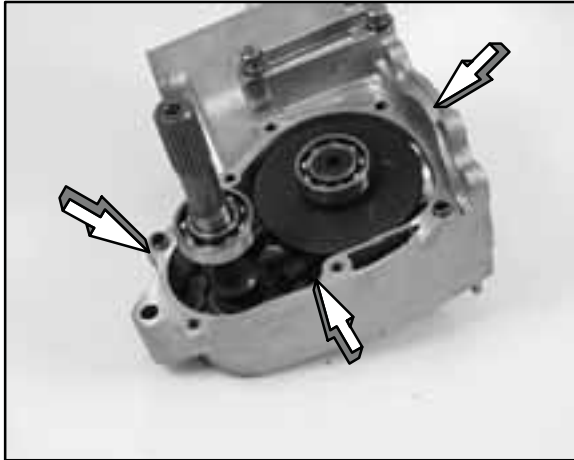
1. Reinstall the chain onto the front output shaft and rear output shaft.



2. Install front and rear output shafts into the case.



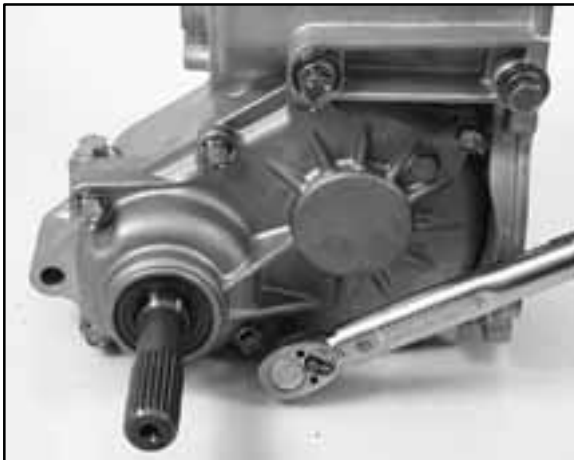
3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Polaris Crankcase Sealant to the mating surfaces.



**Crankcase Sealant
(PN 2871557)**

4. Reinstall the thrust button shim, thrust button, and other shims into the cover. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).

NOTE: Make sure that the case locating pins (knock pipes) are in place.



**Front Cover Bolt Torque:
27-34 ft. lbs. (36.50-46 Nm)**

5. Apply grease to the seal lips. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new front and rear output shaft seals.
6. Install pinion shaft with bearing.
7. Install retainer plate with flat side toward bearing.

8. Apply Loctite™ 262 (Red) (PN 2871951) to screw threads and torque screws to 6-12 ft. lbs. (8-16 Nm).



**Pinion Retainer Plate
Bolt Torque:
6-12 ft. lbs. (8-16 Nm)**

9. Install a new needle bearing, the 24T reverse sprocket, washer, and a new snap ring. Install the shift dogs and wave spring. Install the washer, a new needle bearing and the high gear. Install the press fit gear and ball bearing.
10. Install a new snap ring at this time. When installing the new snap ring, open the the snap ring just far enough to go over the shaft, to avoid stressing the snap ring. If the snap ring is overstressed it could come off the shaft and cause internal damage to the transmission.

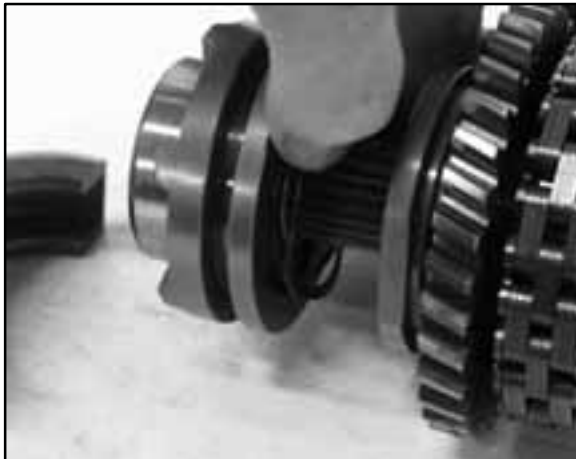




11. Slide the reverse shaft assembly through the silent chain.



12. Install a new needle bearing, the low gear, the thrust washer and the snap ring. Use of a new snap ring is recommended.
13. Install the engagement dogs, wave springs, and bearing.
14. Install the ball bearing onto the end of the input shaft.



15. As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.

NOTE: Use caution when installing the fork, the spring can easily fall out.

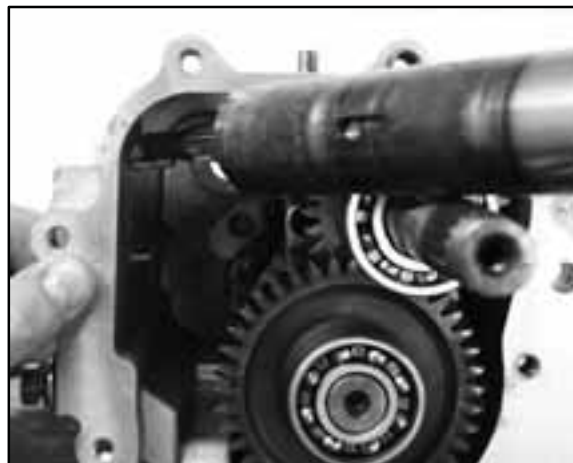
NOTE: Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.



16. Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.



17. Position the shift forks up and so the the pins point toward the 9 o'clock position, before installing the shift drum assembly.



18. Replace and grease the O-ring's on the shift drum before installation.



19. Install the shift drum into the case.

NOTE: Make sure shift shaft pins are properly positioned in the slot on selector arms.

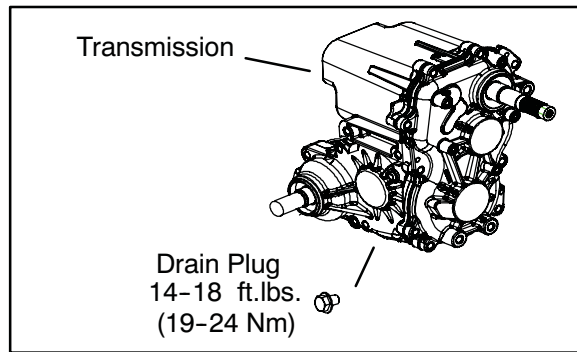
20. Lift the shift rail slightly and rotate the rail/fork assembly so it meshes with the tracks on the shift drum. Be sure the wave springs are properly in place and that the shift rail is seated into the pocket on the backside of the case.

21. Install the helical gear and bearing onto the pinion shaft.
22. Clean the mating surfaces of the case and cover. Apply Crankcase Sealant (PN 2871557) to the mating surfaces. Be sure the locating pins (knock pipes) are in place. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).



**Front Cover Bolt Torque:
27-34 ft. lbs. (36.50-46 Nm)**

23. Grease the seal lips of the input shaft seal. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new input shaft seal.
24. Install drain plug with a new sealing washer. Torque drain plug to 14-18 ft. lbs. (19-24 Nm).

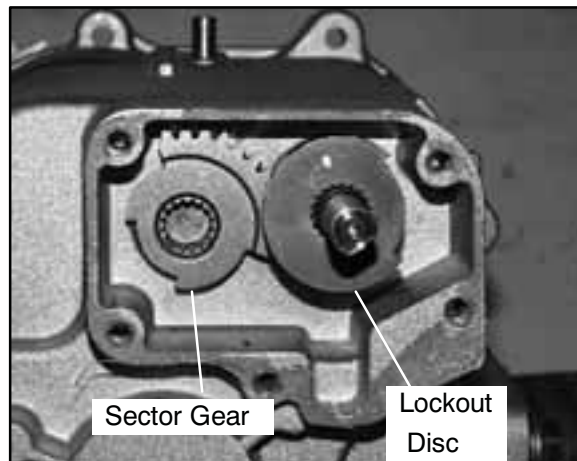


Drain Plug Torque:
14-18 ft. lbs. (19-24 Nm)

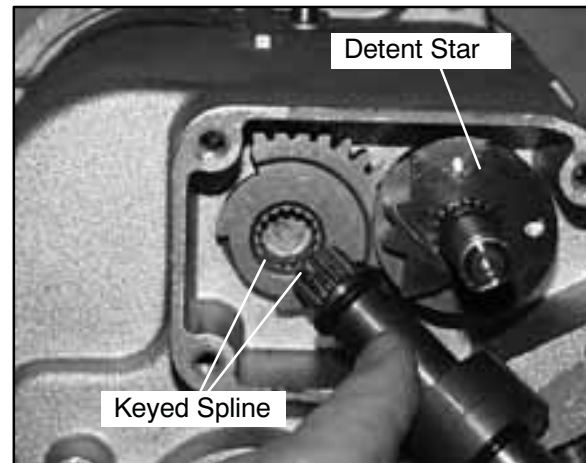
25. Place a small amount of grease (**PN 2871551**) into the pocket before installing the sector gear. Install the shift gear (16T) on the shift drum shaft. Install the sector gear in the bushing pocket on the left side. Aligning the timing marks on the gears.

NOTE: Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

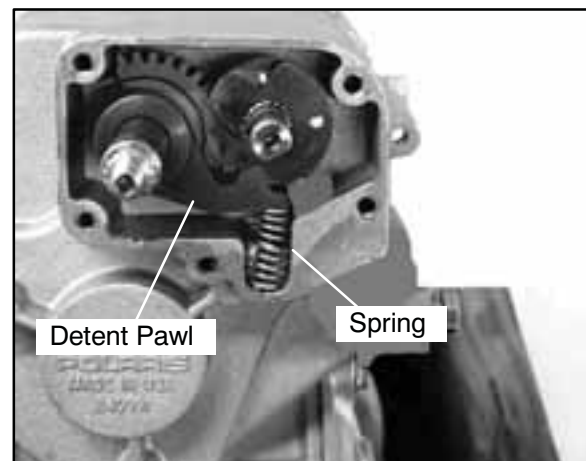
26. Install the lockout disc. Use the white marks that were previously applied for reference.



27. Install the shift shaft and the detent star. Note the keyed spline on the end of the shaft.



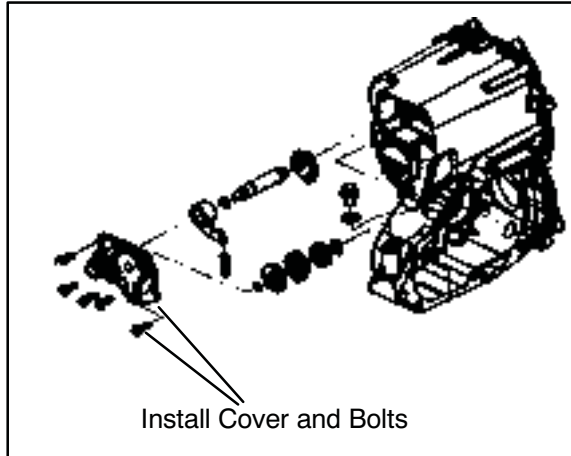
28. Install the detent pawl and spring. Install a new o-ring onto the shift shaft after the detent pawl is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent star. Grease the o-ring on the end of the shift drum.



29. Apply Crankcase Sealant (**PN 2871557**) onto the cover and case mating surfaces. Install the cover and torque the cover bolts to 6-12 ft. lbs. (12-16 Nm).



Maintenance Chapter 2.



Cover Bolt Torque:
6-12 ft. lbs. (12-16 Nm)

30. Install a new bellcrank onto the shift shaft. Note the keyed spline on the bellcrank and shaft. Install the washer and nut. Torque the bellcrank nut to 12-18 ft. lbs. (16-24 Nm).



Bellcrank Nut Torque:
12-18 ft. lbs. (16-24 Nm)

31. Install transmission and add Polaris Premium Synthetic Gear Case Lubricant (PN 2871477) in the recommended amount. Refer to



TROUBLESHOOTING **CHECKLIST**

Check the following items when shifting difficulty is encountered.

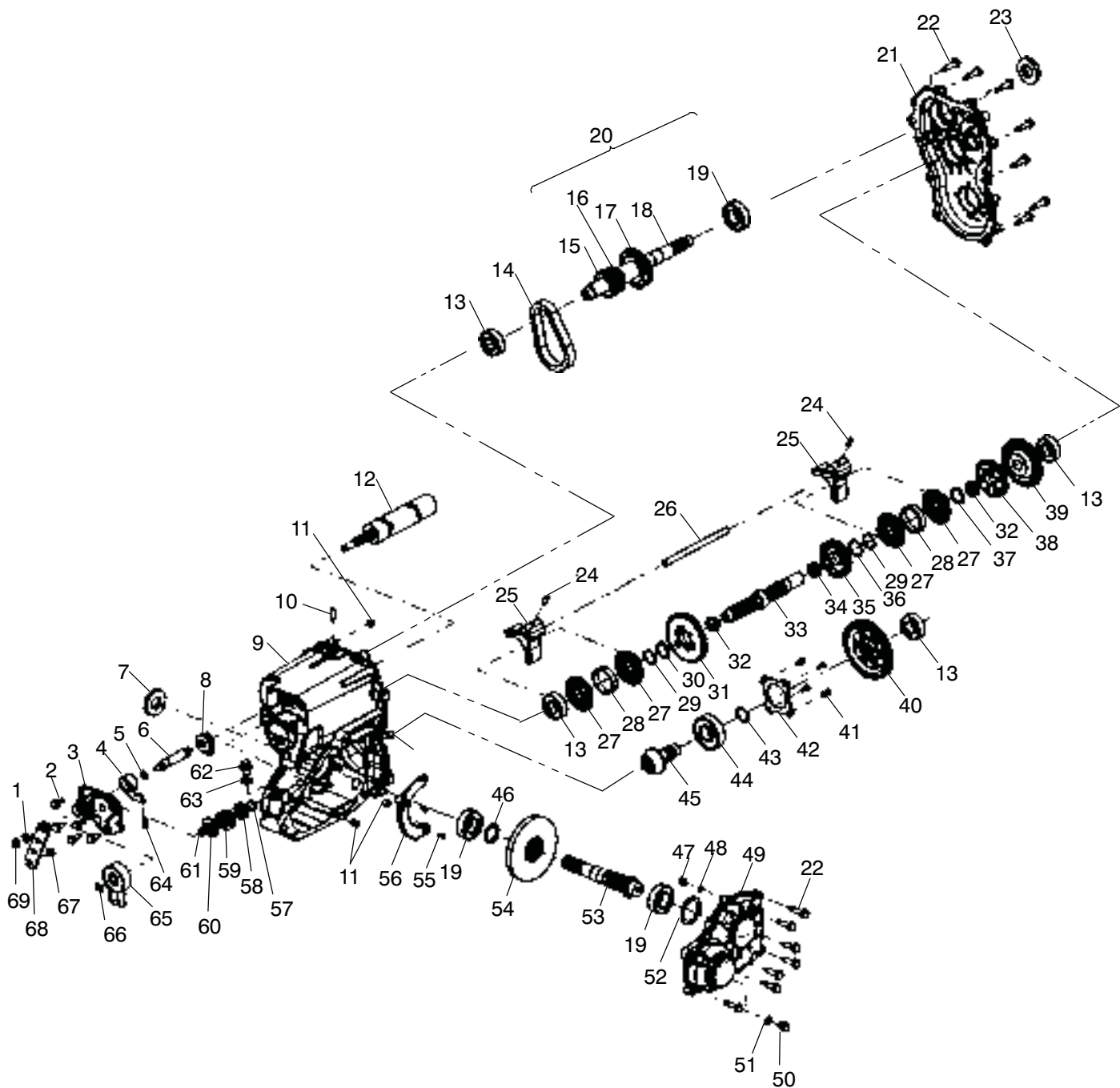
- Idle speed adjustment
- PVT alignment
- Transmission oil type/quality
- Transmission torque stop adjustment (where applicable)
- Engine torque stop adjustment (where applicable)
- Drive belt deflection
- Loose fasteners on rod ends
- Loose fasteners on selector box
- Worn rod ends, clevis pins, or pivot arm bushings
- Linkage rod adjustment and rod end positioning
- Shift selector rail travel
- *Worn, broken or damaged internal transmission components

***NOTE:** To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting linkage rod from transmission bellcrank. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding), damage. Inspect all bearings, circlips, thrust washers and shafts for wear.



2X4 TRANSMISSION EXPLODED VIEW



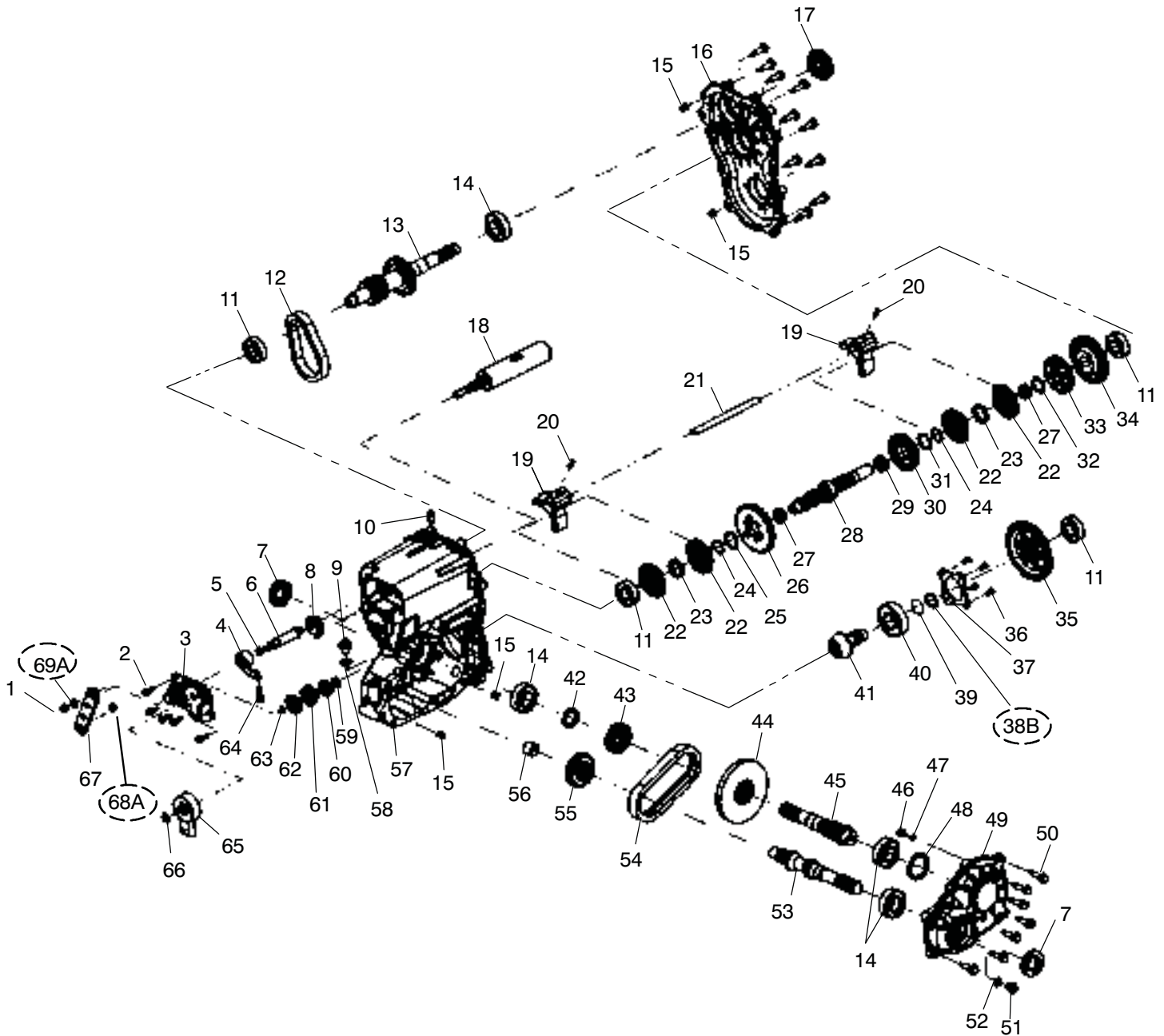


2X4 TRANSMISSION EXPLODED VIEW, CONT.

Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., 2x4 Transmission	35.	1	Sprocket, 24T
1.	1	Washer, Flat	36.	1	Washer
2.	5	Screw	37.	1	Washer
3.	1	Cover	38.	1	Gear, 30T
4.	1	Pawl, Detent	39.	1	Gear, 37T
5.	1	O-Ring	40.	1	Gear, 47T
6.	1	Shaft, Shift	41.	4	Screw
7.	1	Seal	42.	1	Cover, Bearing
8.	1	Gear, 31T	43.	1	Ring, Retaining
9.	1	Gearcase, Main	44.	1	Bearing, Ball
10.	1	Tube, Vent	45.	1	Shaft, 10T
11.	4	Pipe, Knock	46.	1	Washer, Thrust
12.	1	Drum, Shift	47.	1	Button, Thrust
13.	4	Bearing, Ball	48.	AR	Shim
14.	1	Chain, Silent	49.	1	Gearcase, Cover, Front
15.	1	Gear, 15T	50.	1	Plug
16.	1	Sprocket, 16T	51.	1	Washer
17.	1	Gear, 31T	52.	AR	Shim
18.	1	Shaft, Input	53.	1	Shaft, Output, Rear
19.	3	Bearing, Ball	54.	1	Gear, 31T
20.	1	Asm., Input Shaft (Incl. 15-18)	55.	2	Screw
21.	1	Cover, Main, LH	56.	1	Deflector, Oil
22.	17	Screw	57.	1	O-Ring
23.	1	Seal	58.	1	Gear, 16T
24.	2	Pin, Dowel	59.	1	Disc, Lockout
25.	2	Fork	60.	1	Detent, Star
26.	1	Rail, Shift Shaft	61.	1	O-Ring
27.	4	Pin, Dowel	62.	1	Plug, Oil Fill
28.	2	Dog, Engagement	63.	1	Washer
29.	2	Ring, Retaining	64.	1	Spring, Compression
30.	1	Washer	65.	1	Switch
31.	1	Gear, 33T	66.	1	Ring, Retaining
32.	2	Bearing, Needle	67.	1	Nut, Nylok
33.	1	Shaft, Reverse	68.	1	Bellcrank
34.	1	Bearing, Needle	69.	1	Nut, FLEXLOC



4X4 & 6X6 TRANSMISSION EXPLODED VIEW



***NOTE:** Callouts **68A** and **69A** are only on the 4x4 transmission.

***NOTE:** Callout **38B** is not included in the 4x4 transmission, only the 6x6 transmission.



4X4 & 6X6 TRANSMISSION EXPLODED VIEW, CONT.

Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., 4x4 & 6x6 Transmission	35.	1	Gear, 47T
1.	1	Nut	36.	1	Screw
2.	5	Screw	37.	1	Cover, Bearing
3.	1	Cover	38B.	1	Ring, Retaining (6x6 only)
4.	1	Pawl, Detent	39.	1	Spacer
5.	1	O-Ring	40.	1	Bearing, Ball
6.	1	Shaft, Shift	41.	4	Shaft, Pinion, 10T
7.	1	Seal	42.	1	Washer, Thrust
8.	1	Gear, 31T	43.	1	Sprocket, 19T
9.	1	Plug, Oil Fill	44.	1	Gear, 31T
10.	1	Tube, Vent	45.	1	Shaft, Output, Main, Rear
11.	4	Bearing	46.	1	Button, Thrust
12.	1	Chain, Silent	47.	AR	Shim
13.	4	Shaft, Input	48.	AR	Shim
14.	1	Bearing	49.	1	Cover, Output, Front
15.	1	Pipe, Knock	50.	1	Screw, Tapping
16.	1	Cover, LH	51.	1	Plug
17.	1	Seal	52.	AR	Washer
18.	1	Drum, Shift	53.	1	Shaft, Output, Main, Front
19.	3	Fork, Shift	54.	1	Chain, Silent
20.	1	Pin, Dowel	55.	2	Sprocket, 22/22T
21.	1	Rail, Shift Shaft	56.	1	Bushing
22.	17	Engagement Dog	57.	1	Gearcase, Main
23.	1	Spring, Wave	58.	1	Washer
24.	2	Ring, Retaining	59.	1	O-Ring
25.	2	Washer	60.	1	Gear, 16T
26.	1	Gear, 33T	61.	1	Disc, Lockout
27.	4	Bearing, Needle	62.	1	Star, Detent
28.	2	Shaft, Reverse	63.	1	O-Ring
29.	2	Bearing, Needle	64.	1	Spring, Compression
30.	1	Sprocket, 24T	65.	1	Switch
31.	1	Washer	66.	1	Ring, Retaining
32.	2	Washer	67.	1	Bellcrank
33.	1	Gear, 30T	68A.	1	Nut, Nylok (4x4 only)
34.	1	Gear, 37T	69A.	1	Washer (4x4 only)



CHAPTER 9

BRAKES

Special Tools/Specifications/Torques	9.2
Brake System Service Notes	9.3
Brake Noise Troubleshooting	9.3
Hydraulic Brake System Operation	9.4
Brake System Exploded View	9.5
Front Brake Pedal Remove / Install	9.5
Brake Bleeding-Fluid Change Procedure	9.6-9.7
Parking Brake and Brake Line Inspection	9.7
Parking Brake Adjustment	9.7-9.8
Parking Brake Lock Exploded View	9.9
Front Brake Pedal Removal	9.10
Front Pad Removal	9.10
Front Pad Assembly	9.11
Front Pad Adjustment	9.11-9.12
Front Disc Inspection	9.12-9.13
Front Disc Removal/Replacement	9.13
Front Caliper Removal	9.13
Front Caliper Disassembly	9.13-9.14
Front Caliper Inspection	9.14
Front Caliper Assembly	9.14-9.15
Front Caliper Exploded View	9.15
Front Caliper Installation	9.16
Rear Brake Pad Removal	9.16
Rear Brake Pad Installation	9.17-9.18
Rear Brake Caliper Removal	9.18-9.19
Rear Brake Caliper Disassembly/Inspection	9.19-9.20
Rear Brake Caliper Assembly/Installation	9.20-9.22
Rear Brake Caliper Exploded View	9.23
Rear Brake Disc Inspection	9.24
Troubleshooting	9.24



SPECIFICATIONS

Front Brake Caliper		
Item	Standard	Service Limit
Brake Pad Thickness	.298 ± .0073" / 7.56 ± .185 mm	.165" (4.19 mm)
Brake Disc Thickness	.150 -.165" (3.810 - 4.19mm)	.140" (3.556mm)
Brake Disc Runout	-	.005" (.127mm)

Rear Axle Brake Caliper		
Item	Standard	Service Limit
Brake Pad Thickness	.298 ± .0073" / 7.56 ± .185 mm	.165" (4.19 mm)
Brake Disc Thickness	.150-.165" (3.81-4.19mm)	.140" (4.24mm)
Brake Disc Runout	-	.005" (.127mm)

TORQUE SPECIFICATIONS

Item	Torque	Torque (Nm)
Front / Rear Caliper Mounting Bolts	18.0	25
Output Shaft Caliper Mounting Bolts	15.0	21
Brake Line Banjo Bolt	15.0	21
Front Brake Disc	18.0	25
Rear Caliper Body Bolts	18.0	25
Master Cylinder Mounting Bolts	17	23

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool





BRAKE SYSTEM SERVICE

NOTES

Disc brake systems are light weight, low maintenance, and perform well in the conditions ATVs routinely encounter. There are a few things to remember when replacing disc brake pads or performing brake system service to ensure proper system function and maximum pad service life.

- Optional pads are available to suit conditions in your area. Select a pad to fit riding style and environment.
- Do not over-fill the master cylinder fluid reservoir.
- Make sure the brake lever and pedal returns freely and completely.
- Adjust stop pin on front caliper after pad service.
- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable).
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.
- Perform a brake burnishing procedure after installing new pads to maximize service life.

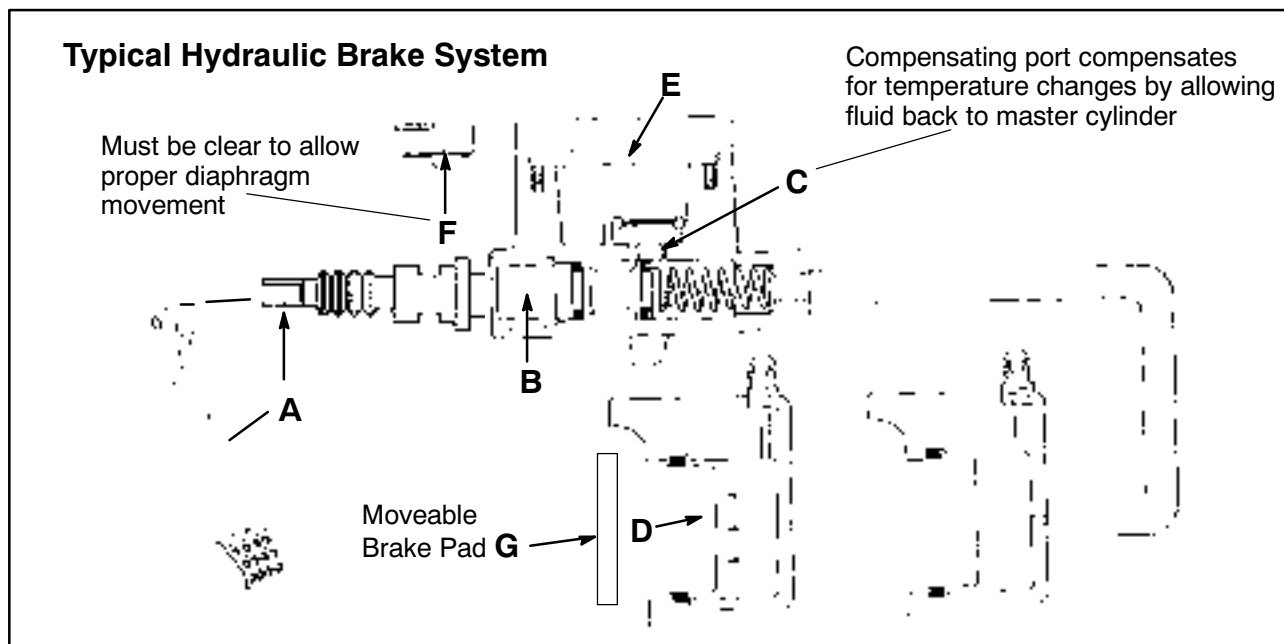
BRAKE NOISE TROUBLESHOOTING

Dirt or dust buildup on the brake pads and disc is the most common cause of brake noise (squeal caused by vibration). If cleaning does not reduce the occurrence of brake noise, Permatex™ Disc Brake Quiet (**PN 2872113**) can be applied to the back of the pads. Follow directions on the package. This will keep pads in contact with caliper piston(s) to reduce the chance of squeaks caused by dirt or dust.

Brake Noise Troubleshooting	
Possible Cause	Remedy
Dirt, dust, or imbedded material on pads or disc	Spray disc and pads with CRC Brakeleen™ or an equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.
<u>Pad(s) dragging on disc (noise or premature pad wear)</u> Improper adjustment Insufficient lever or pedal clearance Master cylinder reservoir overfilled Master cylinder compensating port restricted Master cylinder piston not returning completely Caliper piston(s) not returning Operator error (riding the brake / park brake applied)	Adjust pad stop (front calipers) Check position of controls & switches. Set to proper level Clean compensating port Inspect. Repair as necessary Clean piston(s) seal Educate operator
Loose wheel hub or bearings	Check wheel and hub for abnormal movement.
Brake disc warped or excessively worn	Replace disc
Brake disc misaligned or loose	Inspect and repair as necessary
Noise is from other source (axle, hub, disc or wheel)	If noise does not change when brake is applied check other sources. Inspect and repair as necessary
Wrong pad for conditions	Change to a softer or harder pad



HYDRAULIC BRAKE SYSTEM OPERATION



The Polaris brake system consists of the following components or assemblies: brake pedal; master cylinder; hydraulic hose; brake calipers (slave cylinder); brake pads; and brake discs, which are secured to the drive line.

When the foot activated brake lever (A) is applied it contacts a piston (B) within the master cylinder. As the master cylinder piston moves inward it closes a small opening (compensating port) (C) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the piston (D) located in the brake caliper moves outward and applies pressure to the moveable brake pad. This pad contacts the brake disc and moves the caliper in its floating bracket, pulling the stationary side pad into the brake disc. The resulting friction reduces brake disc and vehicle speed. As the lever pressure is increased, the braking affect is also increased.

The friction applied to the brake pads will cause the pads to wear. As these pads wear, the piston within the caliper moves further outward and becomes self adjusting. Fluid from the reservoir fills the additional area created when the caliper piston moves outward.

Brake fluid level is critical to proper system operation. Too little fluid will allow air to enter the system and cause the brakes to feel spongy. Too much fluid could cause brakes to drag due to fluid expansion.

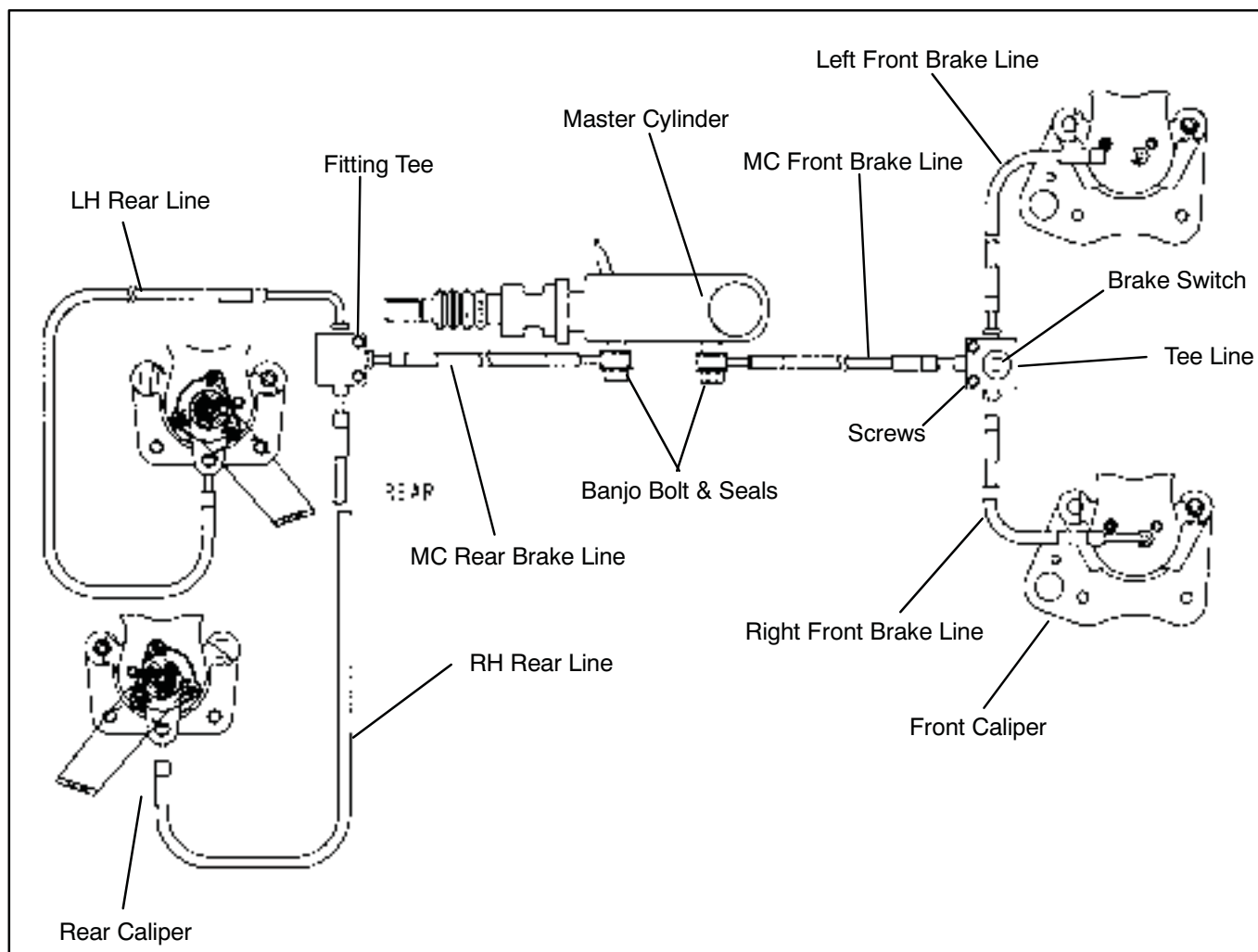
Located within the master cylinder is the compensating port (C) which is opened and closed by the master cylinder piston assembly. The port is open when the lever is released and the master cylinder piston is outward. As the temperature within the hydraulic system changes, this port compensates for fluid expansion (heated fluid) or contraction (cooled fluid). During system service, be sure this port is open. Due to the high temperatures created within the system during heavy braking, it is very important that the master cylinder reservoir have adequate space to allow for fluid expansion. **Never overfill the reservoir!** Do not fill the reservoir past the MAX LEVEL line!

This system also incorporates a diaphragm (E) as part of the cover gasket; and a vent port (F) located between the gasket and the cover. The combination diaphragm and vent allow for the air above the fluid to equalize pressure as the fluid expands or contracts. Make sure the vent is open and allowed to function. If the reservoir is over filled or the diaphragm vent is plugged the expanding fluid may build pressure in the brake system leading to brake failure.

When servicing Polaris brake systems use only Polaris DOT 3 Brake Fluid (PN 2870990) or DOT 4 Brake Fluid. Polaris brake fluid is sold in 5.5 oz. bottles. **WARNING:** Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to early brake fade and the possibility of serious injury.



BRAKE SYSTEM EXPLODED VIEW

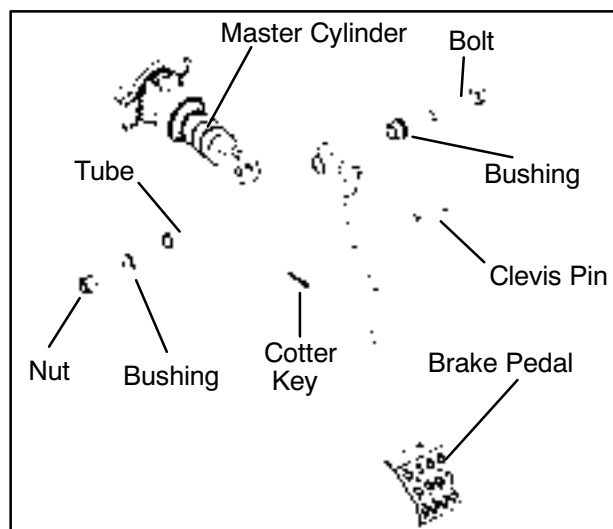


FRONT BRAKE PEDAL REMOVAL / INSTALL

1. Open the hood. Locate the master cylinder.
2. Remove the nut, bushing, tube, and bolt from the brake pedal.
3. Remove the clevis pin and cotter key from the master cylinder to remove the brake pedal.
4. Reverse Steps 1-3 for foot brake installation. After installing the foot brake check pedal freeplay. Pedal freeplay should not exceed .090" (2.286 mm).

Brake Pedal Freeplay:

.090" (2.286 mm)





BRAKE BLEEDING-FLUID CHANGE

NOTE: When bleeding the brakes or replacing the fluid always start with the furthest caliper from the master cylinder.

CAUTION:

Always wear safety glasses.

CAUTION:

Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean reservoir cover thoroughly.
2. Remove cover from reservoir.



3. If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.

Mity Vac™ (PN 2870975)

4. Add brake fluid to the indicated MAX level of reservoir.

Polaris DOT 3 Brake Fluid (PN 2870990)
Or
DOT 4 Brake Fluid

5. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on caliper bleeder screw. Attach a clean, clear hose to fitting and place the other end in a clean container. Be sure the hose fits tightly on fitting.
6. *Slowly* pump foot pedal until pressure builds and holds.
7. Hold brake pedal on to maintain pedal pressure, and open bleeder screw. Close bleeder screw and release foot pedal.

NOTE: Do not release foot pedal before bleeder screw is tight or air may be drawn into master cylinder.

8. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

CAUTION:

Maintain at least 1/2" (1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

9. Tighten bleeder screw securely and remove bleeder hose.
10. Repeat procedure Step 5 through Step 9 for the remaining calipers.
11. Add brake fluid to MAX level inside reservoir.



Master Cylinder Fluid Level

**Between the MIN line and the
MAX line of reservoir.**

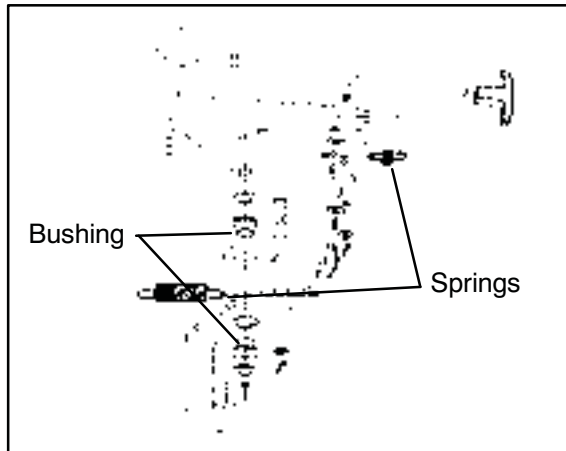




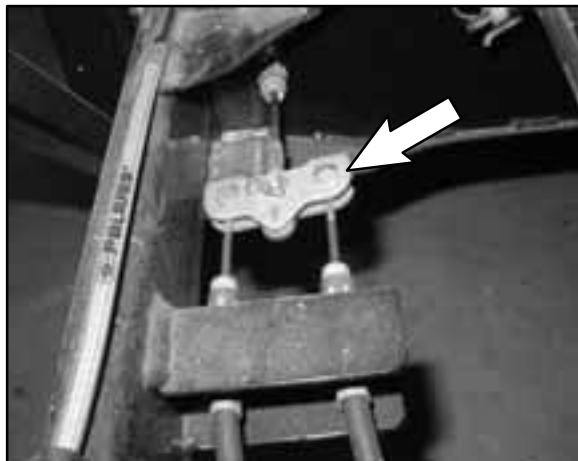
12. Install master cylinder reservoir cover.
13. Field test machine at low speed before putting into service. Check for proper braking action and pedal reserve. With pedal firmly applied, pedal reserve should be no less than 1/2" (1.3 cm).
14. Check brake system for fluid leaks.

PARKING BRAKE AND BRAKE LINE INSPECTION

1. Inspect the springs and bushings on the parking brake lever assembly.

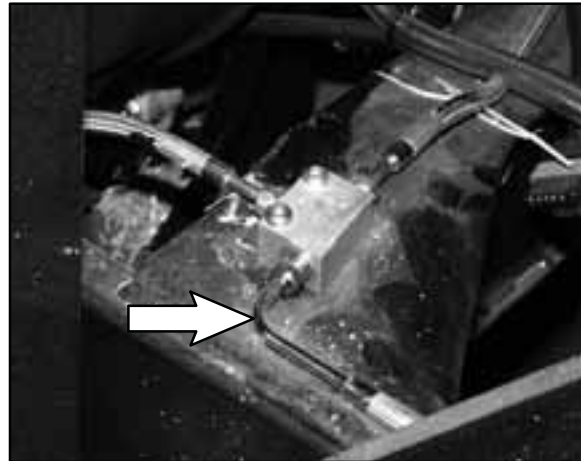


2. Inspect the parking brake cable at the equalizer assembly and at the brake lever on the brake caliper.



3. Inspect the brake lines and brake line connections for possible leaks or loose lines.

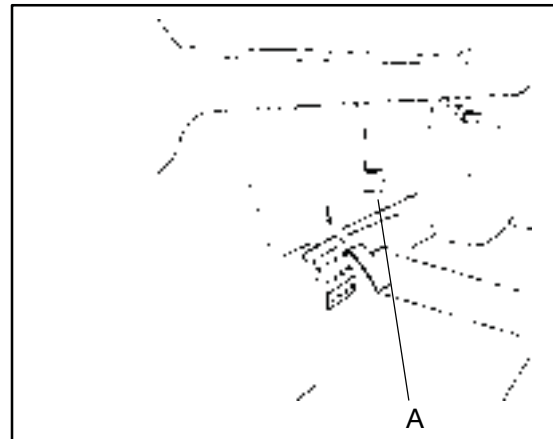
NOTE: Inspect the connections at the master cylinder, brake calipers, and brake valves.



PARKING BRAKE ADJUSTMENT

Parking Brake Inspection

1. Push the parking brake (A) down with your foot.



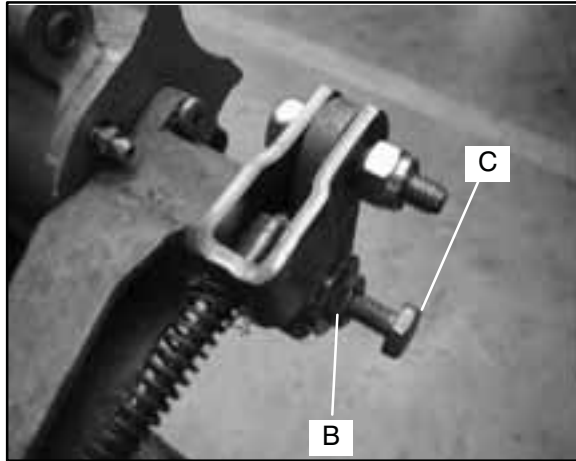
2. After 8 to 12 clicks of lever travel, the vehicle should not roll while parked.
3. If the vehicle moves, adjustment is necessary.
4. Adjust the parking brake where the cable attaches to the lever assembly on the rear brake caliper.

Parking Brake Adjustment

1. Place the vehicle in neutral on a flat level surface.



2. Carefully lift the rear of the vehicle off the ground and stabilize on jack stands.
3. Loosen the jam nut (B) on the rear caliper adjustment bolt (C).

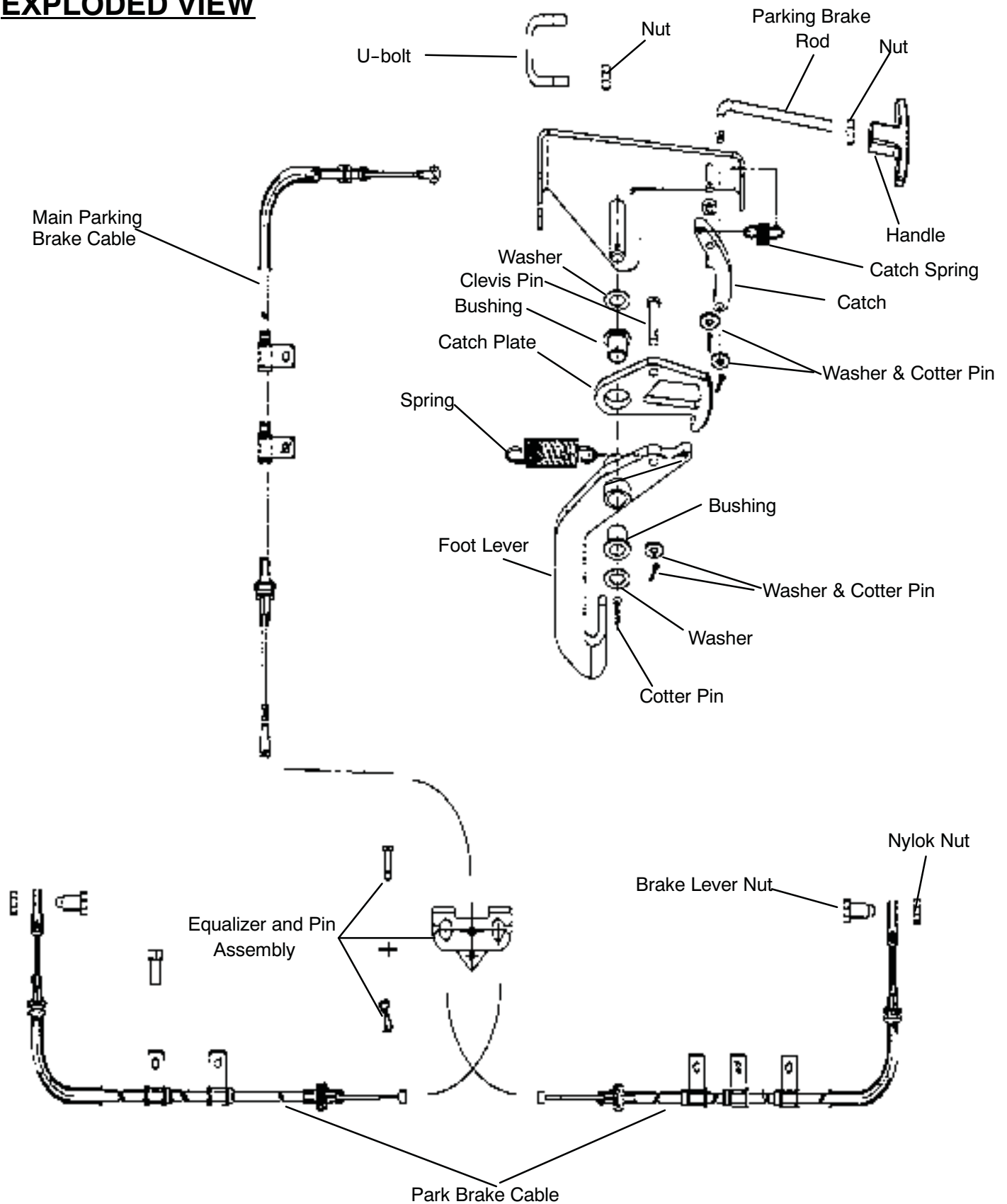


4. Tighten the adjustment bolt (C) until the rear tire will not rotate.
5. Back the adjustment bolt (C) out 1/4 turn.
6. Tighten the jam nut (B) while holding the adjustment nut (C) in place.
7. Repeat this procedure on the other rear tire.
8. The parking brake may have to be adjusted to prevent pad wear. The bolt and the jam nut on the rear brake caliper can be adjusted as needed.





PARKING BRAKE LOCK **EXPLODED VIEW**



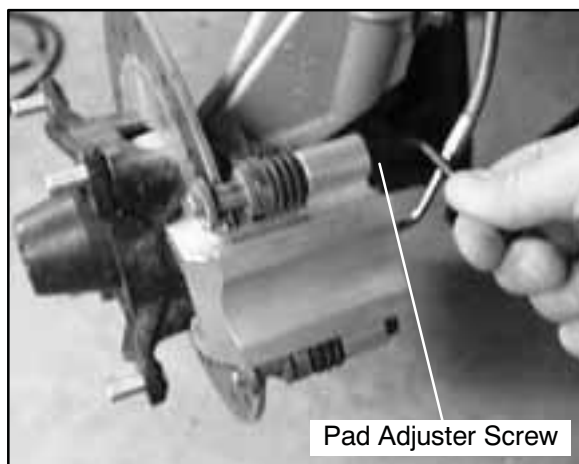


FRONT PAD REMOVAL

1. Elevate and support front of machine.

CAUTION:

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

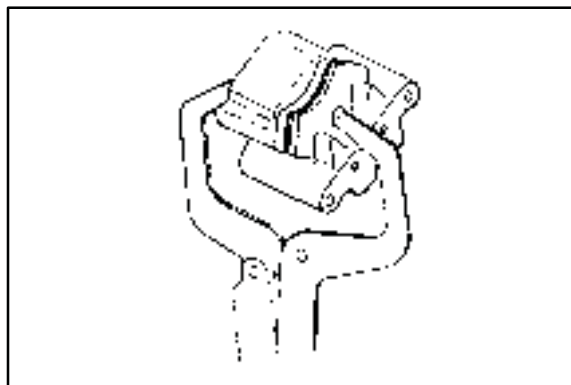


2. Remove the front wheel. Loosen pad adjuster screw 2-3 turns.
3. Remove caliper from mounting bracket.

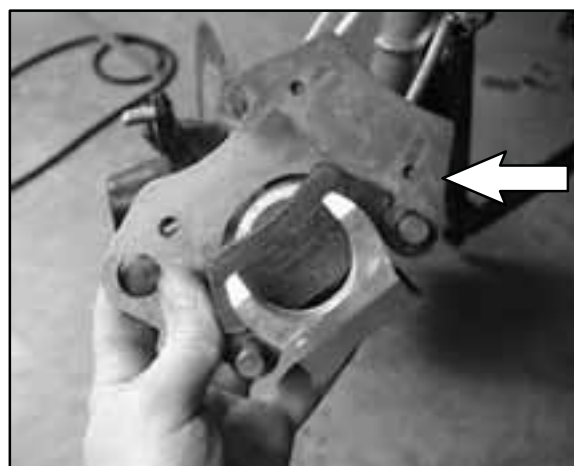


4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

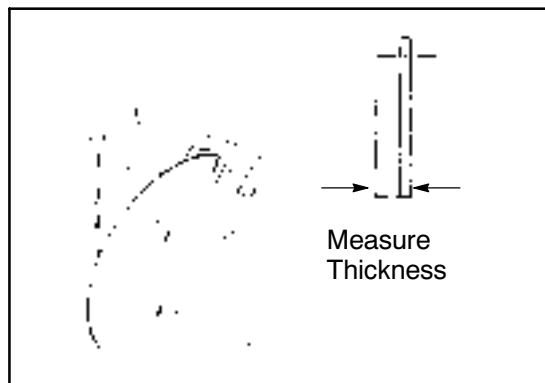
NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.



5. Push upper pad retainer pin inward and slip outer brake pad past edge. Remove inner pad.



6. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.





Front Brake Pad Thickness:

New: 298" (7.0 mm) \pm .007 (.178 mm)

Service Limit: 150" / 3.81 mm

FRONT PAD ASSEMBLY

1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease, and install rubber dust boots.



Polaris Premium All Season Grease

(PN 2871423)

2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. Be sure pads and disc are free of dirt or grease.
3. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolts

Torque 18 ft. lbs. (25 Nm)

4. Slowly pump the brake pedal until pressure has been built up. Maintain at least 1/2" (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.

PAD ADJUSTMENT

1. Install the adjuster screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



2. Be sure fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.



Master Cylinder Fluid
Up to MAX line inside reservoir

3. Install wheels and torque wheel nuts.
4. It is recommended that a burnishing procedure be performed after installation of new brake pads to

extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

Front Wheel Nut Torque:

20 ft. lbs. (27 Nm)

FRONT DISC INSPECTION

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at 8 different points around the pad contact surface using a 0-1" micrometer. Replace disc if worn beyond service limit.



Brake Disc Thickness
New .150-.165" (3.810-4.19 mm)
Service Limit .140" / 3.556 mm

Brake Disc Thickness Variance
Service Limit .002" (.051 mm)
difference between measurements.

3. Mount dial indicator as shown to measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specifications.

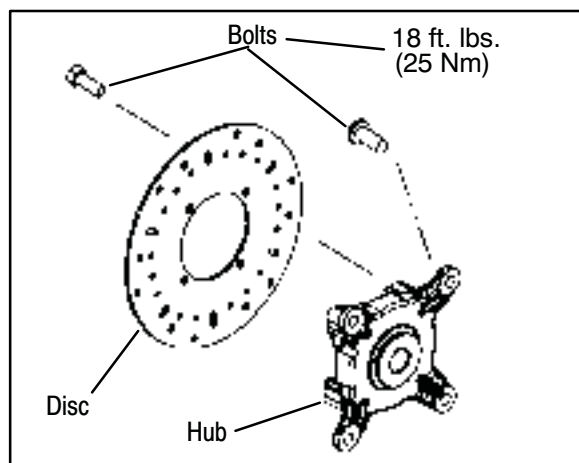


Brake Disc Runout
Service Limit .005" (.127 mm)

FRONT BRAKE DISC REMOVAL / REPLACEMENT

1. Remove bolts and disc.





2. Clean mating surface of disc and hub.
3. Install disc on hub.
4. Install new bolts and tighten to specified torque.

CAUTION: Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

Front Brake Disc Mounting Bolt Torque:

18 ft. lbs. (25 Nm)

Front Caliper Removal

CAUTION:

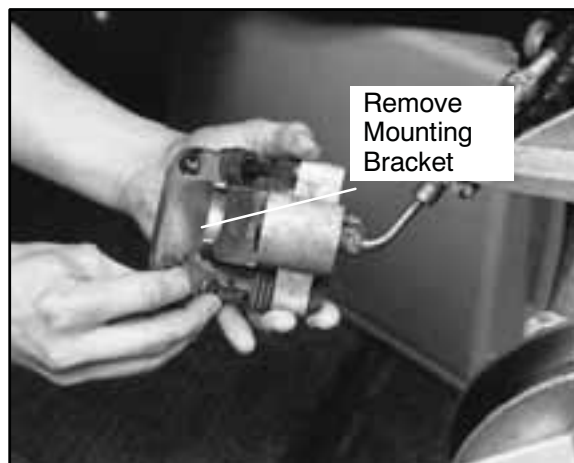
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

1. Remove brake pads. See Page 9.10-9.11.
2. Using a line wrench, loosen and remove brake line to caliper. Place a container under caliper to catch fluid draining from brake line.
3. Remove brake caliper and drain fluid into container.

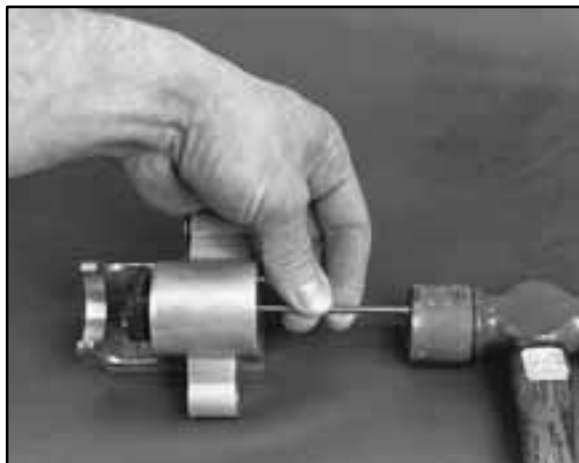


FRONT CALIPER DISASSEMBLY

1. Remove brake pad adjuster screw.
2. Push upper pad retainer pin inward and slip brake pads past edge.
3. Remove mounting bracket, pin assembly and dust boot.



4. Remove piston, dust seal, and piston seal from the caliper body.



5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

NOTE: Be sure to clean seal grooves in caliper body.

FRONT CALIPER INSPECTION

1. Inspect caliper body for nicks, scratches or wear. Measure bore size and compare to specifications. Replace if damage is evident or if worn beyond service limit.



Front Caliper Piston Bore I.D.

Std. 1.5050-1.5040" (3.227-30.202 mm)
Service Limit 1.5060" (38.252 mm)

2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.



Front Caliper Piston O.D.

Std. 1.4985-1.5000" (38.062-38.10 mm)
Service Limit 1.4980" (38.049 mm)

3. Inspect the brake disc and pads as outlined for brake pad replacement this section. See page 9.11-9.12.

FRONT CALIPER ASSEMBLY

1. Install new O-rings in the caliper body. Be sure that the grooves are clean and free of residue or brakes may drag.



2. Coat the piston with clean DOT 3 Brake Fluid (**PN 2870990**) or DOT 4 Brake Fluid. Install piston with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.





- Lubricate the mounting bracket pins with Polaris Premium All Season Grease, and install the rubber dust seal boots.



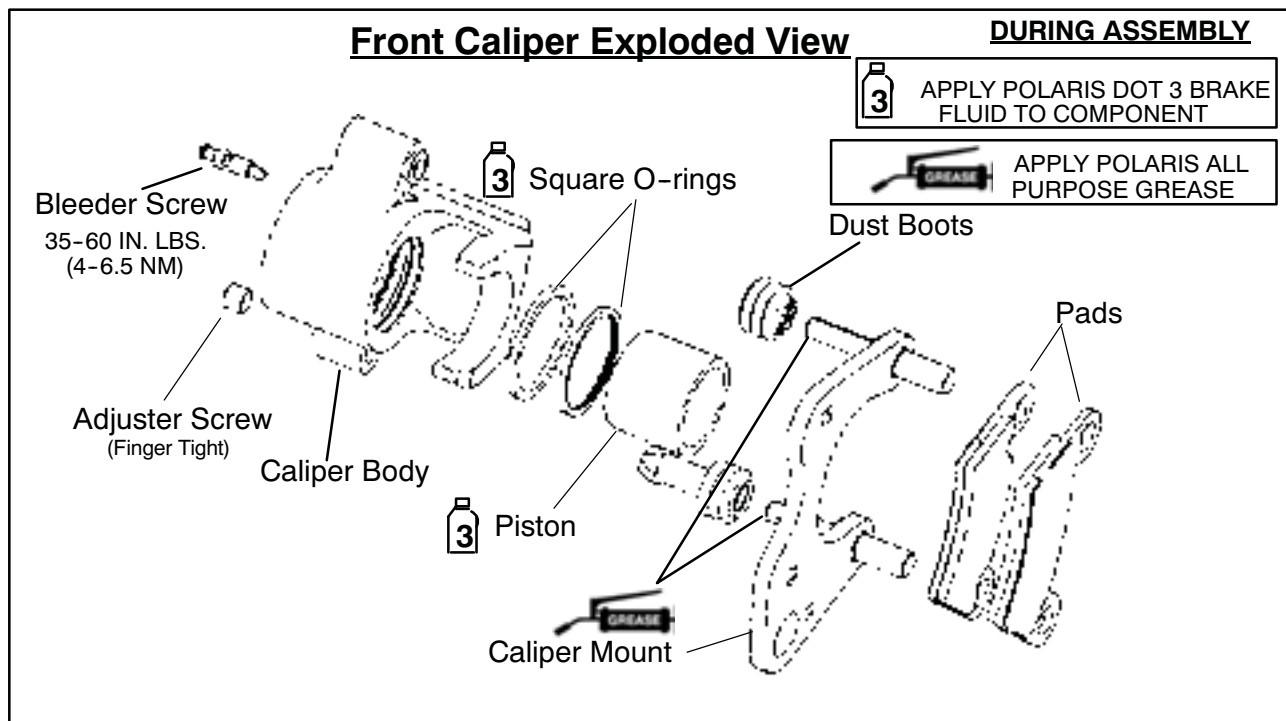
Polaris Premium All Season Grease

(PN 2871423)

- Compress the mounting bracket and make sure the dust seals are fully seated. Install the pads as shown on Page 9.11-9.12. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.



FRONT BRAKE CALIPER EXPLODED VIEW





FRONT CALIPER INSTALLATION

1. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolt Torque:

18 ft. lbs. (25 Nm)

2. Install brake line and tighten securely with a flare nut wrench.
3. Install the adjuster screw and turn until stationary pad contacts disc, then back off 1/2 turn.



4. Follow brake bleeding procedure outlined on Pages 9.6-9.7.
5. Install wheels and torque wheel nuts to specification.

Front Wheel Nut Torque:

35 ft. lbs. (47 Nm).

NOTE: If new brake pads are installed, it is recommended that a burnishing procedure be performed to extend pad service life and reduce noise. Start machine and slowly increase speed to 15 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

REAR BRAKE PAD REMOVAL

1. Elevate and support front of machine.

CAUTION:

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the rear wheel. Loosen pad adjuster screw 2-3 turns.



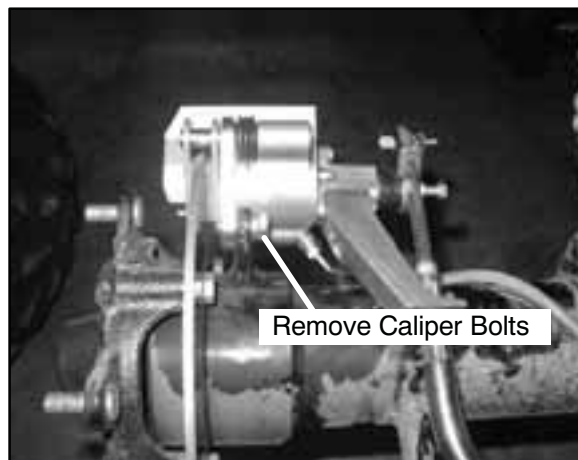
3. Clean caliper area before removal.
4. Remove caliper mounting bolts and lift caliper off of disc.

NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink





or bend brake line.



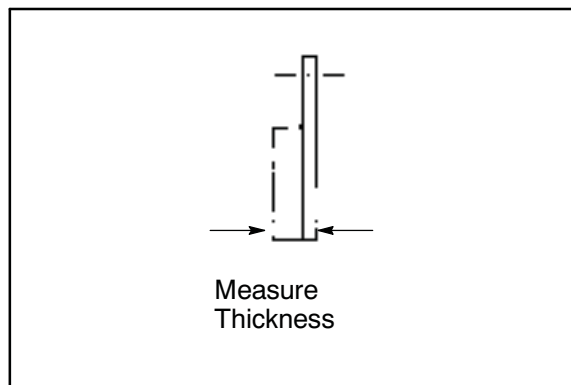
5. Push caliper piston into caliper bore slowly with pads installed.

NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

6. Remove the brake pads.



7. Clean pad retainer pins with a wire brush.
8. Clean the caliper with brake cleaner or alcohol.
9. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Rear Brake Pad Thickness
New .298 ± .0073" (7.56 ± .185 mm)
Service Limit .165" (4.19 mm)

REAR BRAKE PAD INSTALLATION

1. Install new pads in caliper body.



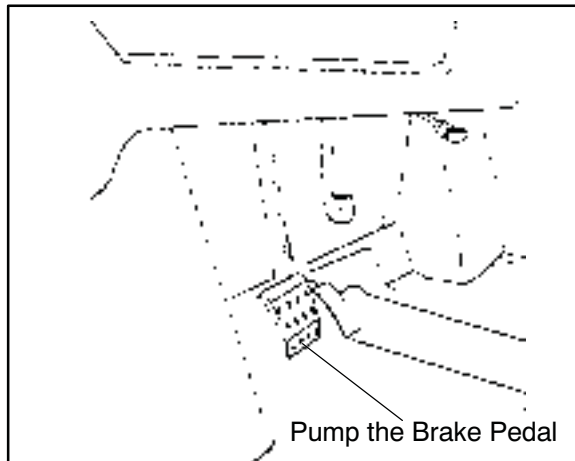


2. Install caliper and torque mounting bolts.

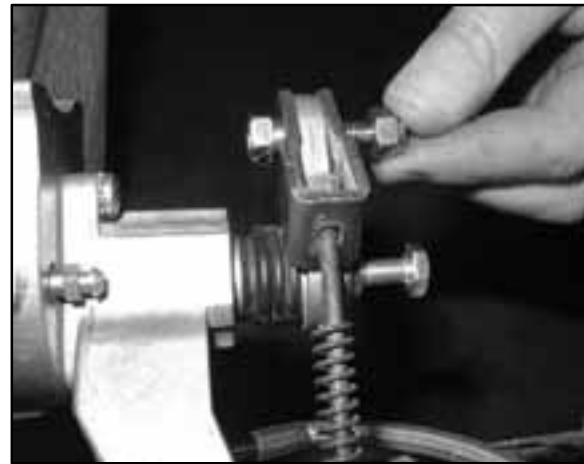
Rear Brake Caliper:

Torque 18 ft. lbs. (24.9 Nm)

3. Slowly pump the brake pedal until pressure has been built up. Maintain at least 1/2" (12.7 mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.



3. Remove the parking brake cable nut and bolt.



4. It is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 15 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

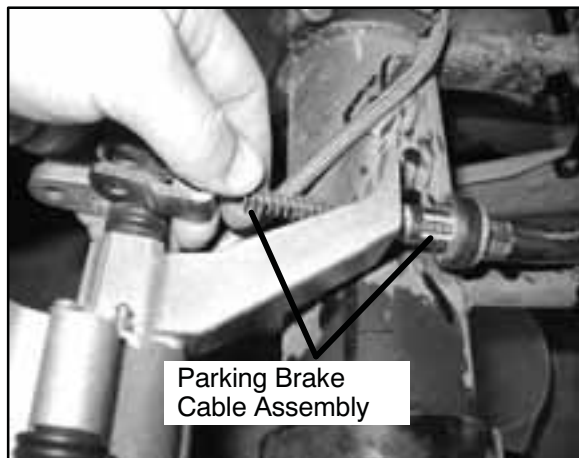
4. Remove the parking brake cable assembly from the brake caliper assembly.

REAR CALIPER REMOVAL

CAUTION:

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

1. Safely support the rear of the machine.
2. Using a flare nut wrench, remove the brake line. Place a container to catch brake fluid draining from brake lines.



5. Remove the two brake caliper assembly attaching bolts.
6. Clean disc, caliper body, and pistons with brake cleaner or alcohol.

3. Lift the plunger, washer, and compression spring from the caliper body. Inspect components and replace if needed.

REAR CALIPER DISASSEMBLY / INSPECTION

1. Loosen three screws on the parking brake cable assembly.



2. Lift the parking brake cable assembly from the caliper.

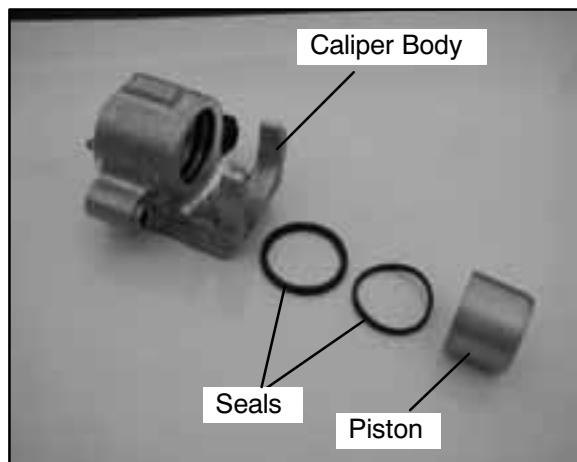
4. Remove the piston from the caliper. Inspect the caliper piston for nicks scratches or damage and replace if necessary.
5. Inspect caliper body for nicks, scratches or wear. Measure bore size and compare to specifications. Replace if damage is evident or if worn beyond service limit.

**Rear Caliper Piston Bore I.D.**

Std. 1.2550-1.2540" (31.877-31.852 mm)
Service Limit 1.256" (31.902 mm)

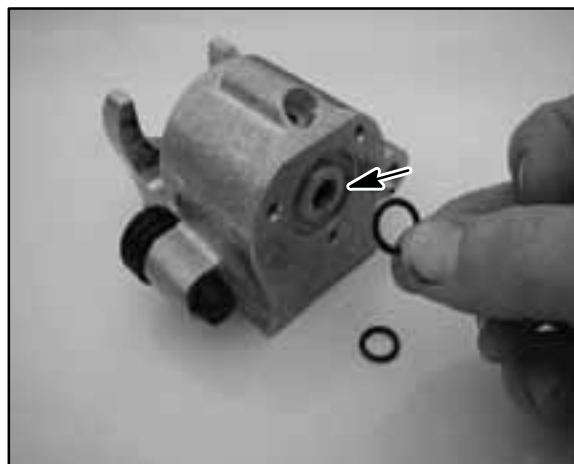
REAR CALIPER ASSEMBLY/INSTALLATION

1. Install new O-rings in the piston hole of the caliper body. Be sure grooves are clean and free of residue or brakes may drag.



2. Coat piston with clean DOT 3 Brake Fluid (**PN 2870990**) or DOT 4 Brake Fluid. Install piston with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.

3. Install two new O-rings in the plunger hole of the caliper assembly. Be sure grooves are clean and free of residue.



4. Lubricate the mounting bracket pins with Polaris Premium All Season Grease, and install the rubber dust seal boots.



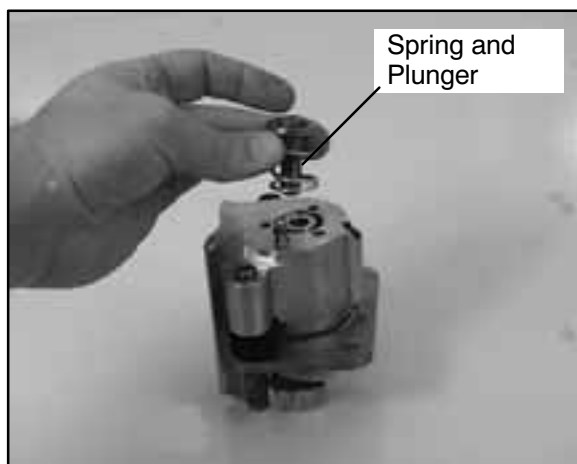
Polaris Premium All Season Grease
(PN 2871423)

5. Compress the mounting bracket and make sure the dust seals are fully seated. Install the pads as shown on Page 9.19. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

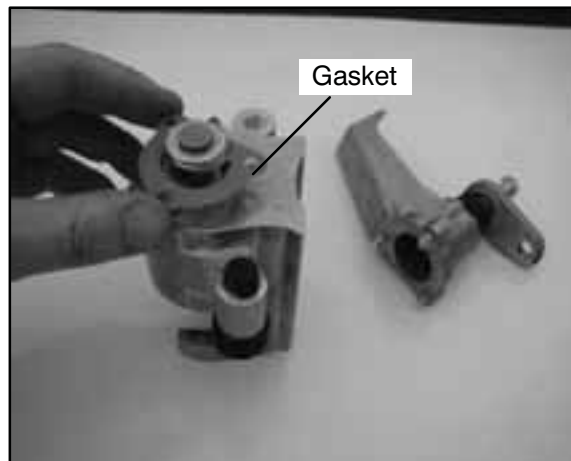




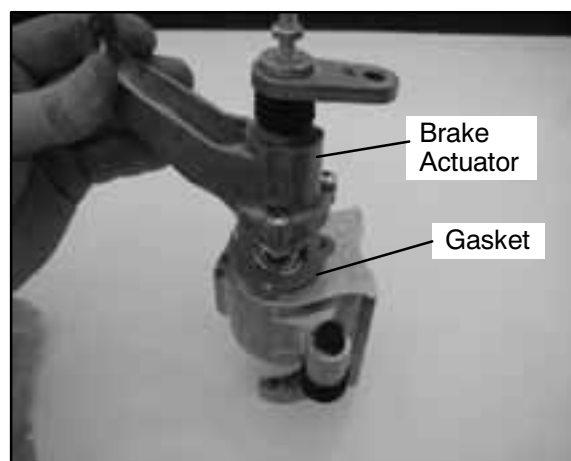
6. Install the spring , washer, and plunger into the caliper assembly.



7. Install the gasket onto the caliper body. Align the gasket with the three holes in the caliper body.



8. Install the emergency brake actuator onto the caliper body. Be sure the gasket holes line up with the caliper body holes and emergency brake actuator holes, to ensure no damage is done to the gasket.





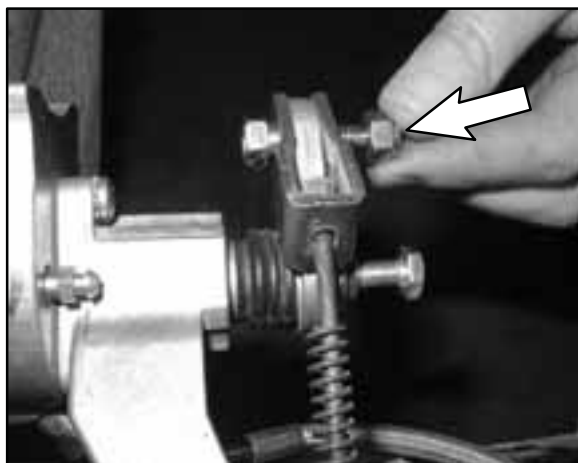
9. Tighten the screws on the caliper assembly.



12. Install caliper and torque mounting bolts. Install brake lines and tighten with a flare nut wrench.



10. Reinstall the emergency brake cable and assembly onto the brake caliper. Secure the emergency brake cable with the nut and bolt.



Caliper Mounting Bolt Torque:

18 ft. lbs. (24.9 Nm)

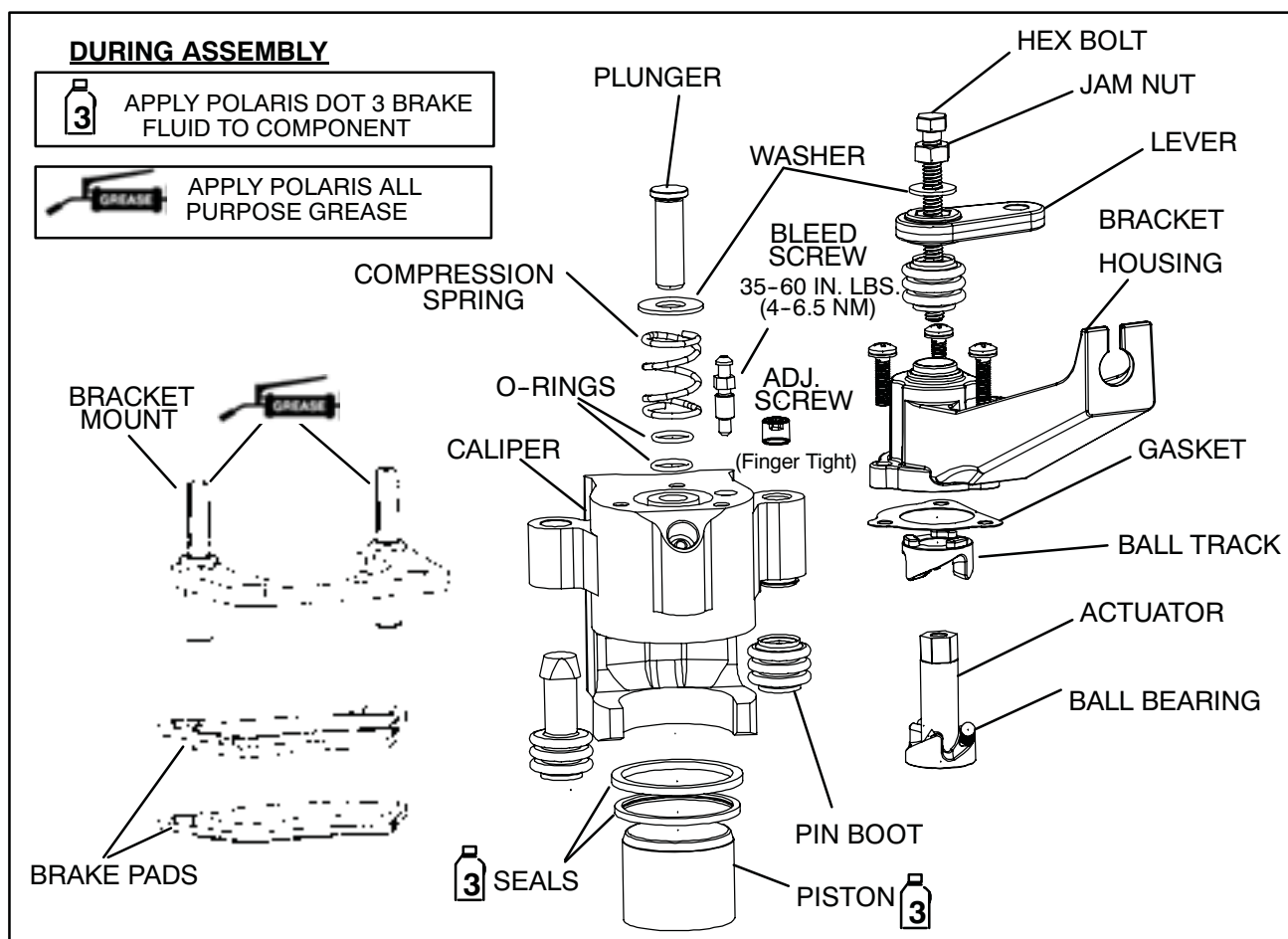
13. Follow bleeding procedure outlined on Pages 9.6-9.7 of this section and refer to system overview and illustration on Page 9.5.
14. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, re-check assembly and installation.

11. Install brake pads in caliper body with friction material facing each other.



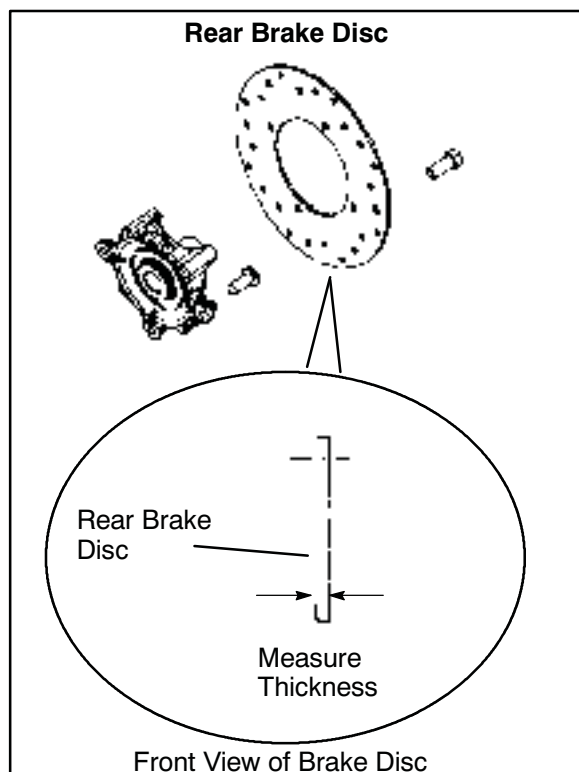


REAR BRAKE CALIPER EXPLODED VIEW



REAR BRAKE DISC INSPECTION

1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
2. Use a 0-1" micrometer and measure disc thickness at 8 different points around perimeter of disc. Replace disc if worn beyond service limit.

**Brake Disc Thickness****New .150-.165" (3.81-4.19 mm)****Service Limit .140" (3.556 mm)****Brake Disc Thickness Variance****Service Limit .002" (.051 mm)
difference between measurements**

3. Mount dial indicator and measure disc runout. Replace the disc if runout exceeds specifications.

Brake Disc Runout**Service Limit .005" (.127 mm)**

4. Install brake line and tighten with a flare nut wrench.
5. Follow bleeding procedure outlined on Pages 9.6-9.5 of this section.

6. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.
7. Dirty/contaminated friction pads
8. Improper alignment
9. Worn disc
10. Worn disc splines

TROUBLESHOOTING

Brakes Squeal**Poor Brake Performance**

- Air in system
- Water in system (brake fluid contaminated)
- Caliper/disc misaligned
- Caliper dirty or damaged
- Brake line damaged or lining ruptured
- Worn disc and/or friction pads
- Incorrectly adjusted stationary pad
- Worn or damaged master cylinder or components

Pedal Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

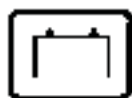
Caliper Overheats (Brakes Drag)

- Compensating port plugged
- Pad clearance set incorrectly
- Parking brake lever incorrectly adjusted
- Brake pedal binding or unable to return fully
- Parking brake left on
- Residue build up under caliper seals
- Operator riding brakes

Brakes Lock

- Alignment of caliper to disc
- Caliper pistons sticking
- Improper assembly of brake system components





CHAPTER 10 ELECTRICAL

Special Tools/Service Notes	10.2
Timing Check Procedure	10.3
Coolant Sensor Tests	10.4
Fan Motor Tests	10.4
Fan Control Switch Test	10.4
Flywheel I.D.	10.5
Alternator Components	10.6
Ignition System Testing Flow Chart	10.7
Ignition System Troubleshooting	10.8
CDI Output Tests	10.8
Charging System Testing	10.8–10.10
Battery Activation/Service	10.11–10.14
Head Light/Brake Light Lamp Service	10.14–10.15
Brake Light Switch	10.15
Gear Indicator Light Circuit Operation	10.15
Indicator Lamp Replacement	10.16
Starter System Troubleshooting	10.16
Starter System Testing	10.16
Starter Motor Service	10.16–10.19
Starter Drive	10.19
Starter Assembly Exploded View	10.19
Starter System Testing Flow Chart	10.20–10.21
2x4 Wiring Diagram	10.23
4x4 & 6x6 Wiring Diagram	10.24



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
PV-43568	Fluke™ 77 Digital Multimeter
2870630	Timing Light
2870836	Battery Hydrometer
2460761	Hall Sensor Probe Harness
2871745	Static Timing Light Harness

ELECTRICAL SERVICE NOTES

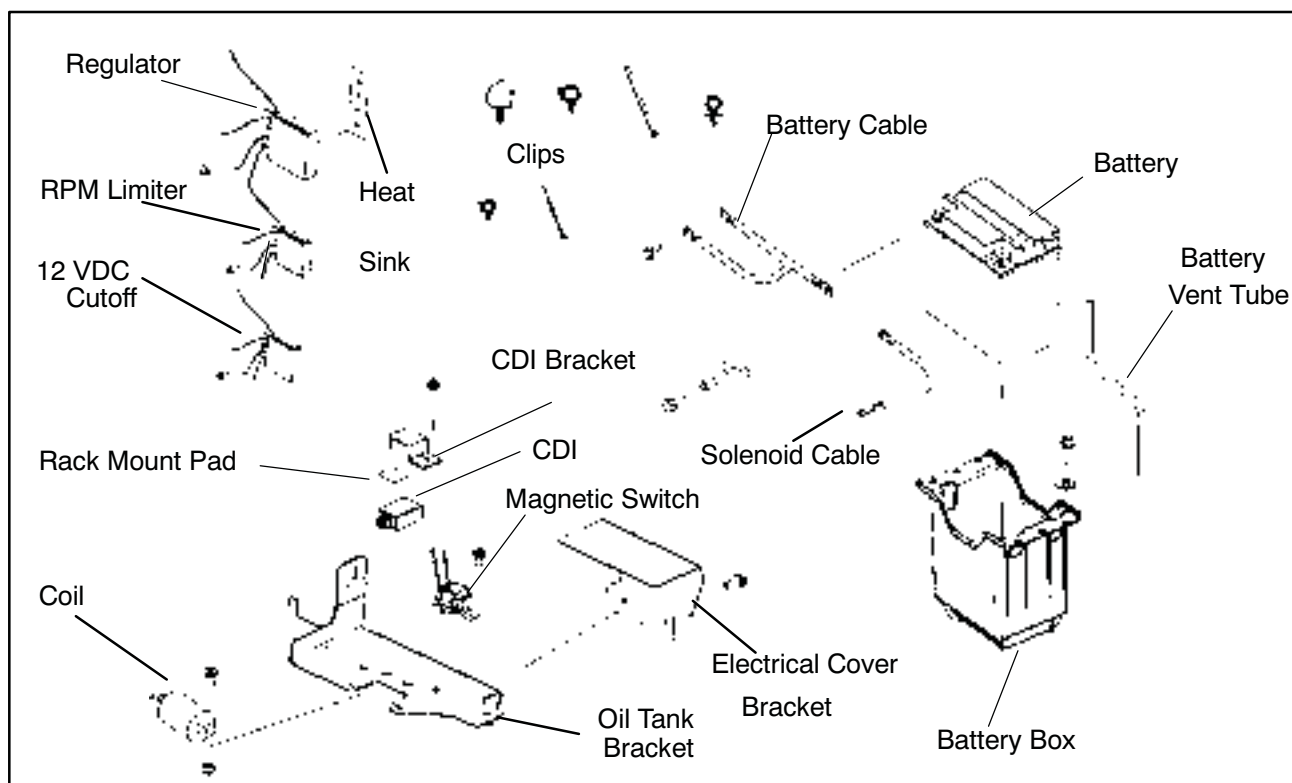
Keep the following notes in mind when diagnosing an electrical problem.

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a resistance value under 10

Ohms, remember to subtract meter lead resistance from the reading. Connect the leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.

- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's manual included with your meter for more information.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke™ 77 Digital Multimeter (PV-43568). This meter is used for when diagnosing electrical problems. Readings obtained with other meters may differ.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect it from the wiring harness or power supply.

ELECTRICAL COMPONENTS IDENTIFICATION





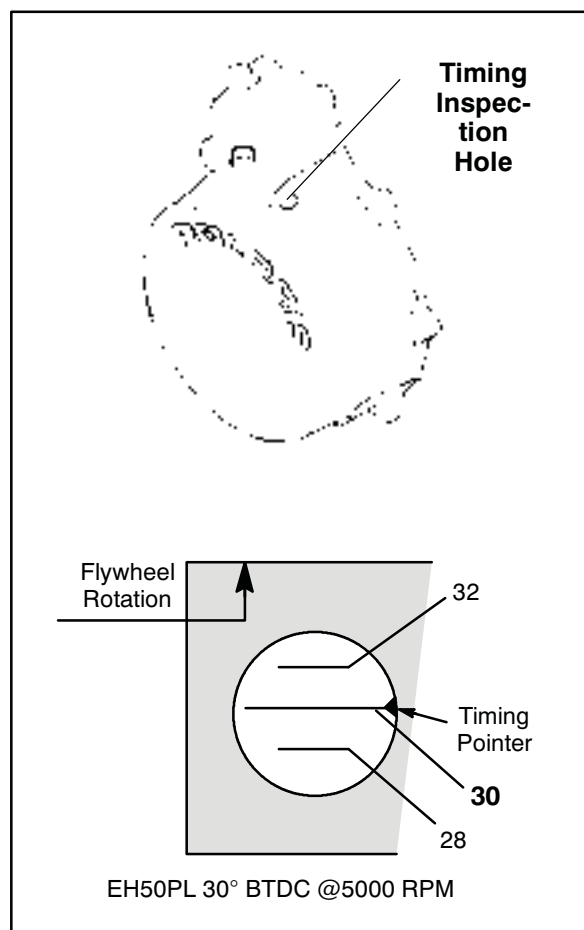
TIMING CHECK PROCEDURE

1. The ignition timing check hole is in the starter recoil/magneto housing. Remove the check plug.

NOTE: NOTE: The ignition timing marks are stamped on the outside of the flywheel. Ignition timing must be inspected with the engine at room temperature (68°F / 20° C).

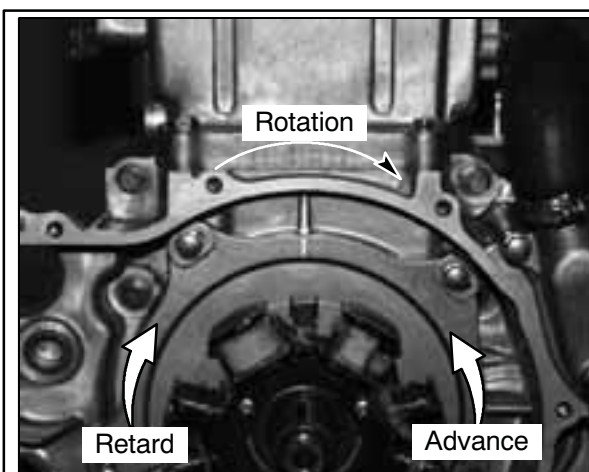
2. With the transmission in neutral, start the engine and set engine speed to 5000 ± 200 RPM.
3. Direct the timing light at the ignition timing check hole and check the ignition timing. **NOTE:** Do not allow the engine to warm up. The timing will retard approximately 2° when the engine is warm.

If the ignition timing is not within the specified range, adjust the stator plate position as described below.



Stator Adjustment

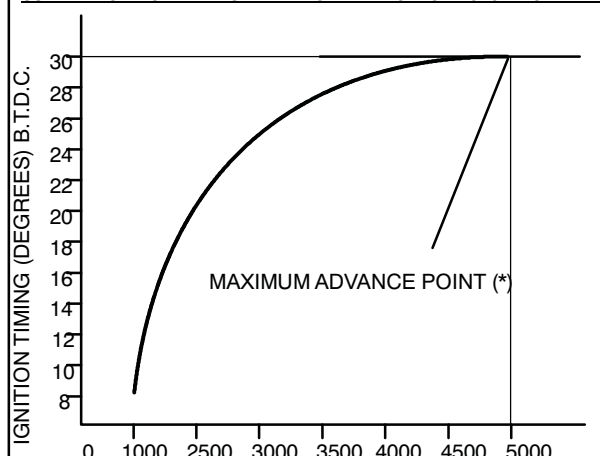
1. Remove the magneto housing.
2. Remove the flywheel.
3. Loosen the stator plate screws and adjust the stator plate position. **NOTE:** Moving the stator plate clockwise retards (delays) the ignition timing. Moving the plate counterclockwise advances it.



TYPICAL IGNITION TIMING CURVE * ACTUAL ADVANCE POINT

MAY VARY BY SEVERAL HUNDRED RPM ABOVE OR BELOW 5000.

USE THE POINT OF MAXIMUM ADVANCE WHEN CHECKING IGNITION TIMING





COOLANT TEMPERATURE SENSOR TEST (HOT LIGHT)

With the ignition switch (and engine stop switch) "ON", power is delivered to the hot light via the Red/White wire. The Blue/White wire (ground) out of the light socket is connected to the coolant temperature sensor on the cylinder head. In normal operating conditions, the temperature sensor is non-conductive (open). If engine coolant reaches the specified temperature, the sensor becomes conductive completing the ground path for the light.

With engine cold, disconnect lead and measure resistance of sensor between connector terminal and ground. There should be no continuity or very high resistance (megohms).

Hot Light On	221° F (105° C)
--------------	-----------------

FAN CONTROL CIRCUIT OPERATION / TESTING

The fan switch is located on the radiator. Power is supplied to the fan switch via the Red/Black wire when the ignition key is ON. When the fan switch reaches the specified temperature, it becomes conductive and sends power to the fan motor through to the Orange/Black wire. The ground path for the fan motor is through the Brown harness wire.

CAUTION: *Keep hands away from fan blades during this procedure. Serious personal injury could result.*

NOTE: The fan switch may not function or operation may be delayed if coolant level is low or if air is trapped in the cooling system. Be sure cooling system is full and purged of air. Refer to Maintenance Chapter 2 for cooling system information.

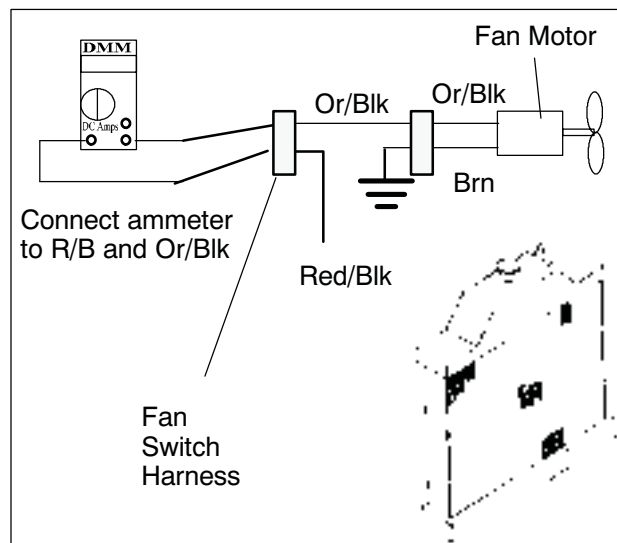
FAN CONTROL SWITCH BYPASS TEST

1. Disconnect harness from fan switch on radiator.
2. Place a jumper wire between the Red/Blk and Org/Blk wires in the connector.
3. With the parking brake on, turn the ignition key (and engine stop switch) "ON". The fan should start running.
4. If the fan runs with the jumper wire installed, check the fan control switch and connector terminals. If the fan does not run or runs slowly with the jumper wire installed, check the fan motor wiring, ground, and motor condition (refer to Fan

Motor Testing this section). Repair or replace as necessary.

FAN MOTOR CURRENT DRAW

A current draw test will provide a good indication of fan motor condition. A worn or damaged fan motor will draw more current, which causes a reduction in blade speed and reduced cooling.



1. Disconnect the harness from the fan switch.
2. Connect a DC ammeter in between the fan switch harness wires as shown.
3. Be sure fan blade is free to rotate.
4. Turn ignition key and engine stop switch to "ON" position. Read the current draw on ammeter with fan running.
5. If the fan motor draws more than 6.5 Amps, replace the motor.

Fan Motor Current Draw:
Should Be Less Than 6.5 Amps

FAN CONTROL SWITCH OPERATION TEST

1. Place switch in a water bath and submerge it to the base of the threads. Do not allow threads to contact container or inaccurate reading will result.
2. Heat the coolant slowly and monitor the temperature with a thermometer or Fluke™ meter pyrometer. The switch should be closed (conductive) at the "ON" temperature indicated in

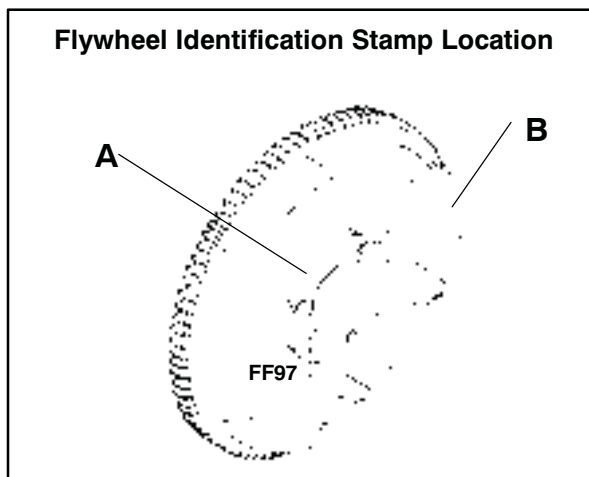


the chart, and stay conductive until the “OFF” temperature is reached.

REFER TO PARTS MANUAL FOR FAN SWITCH APPLICATION		
Fan Switch Part Number	Continuity (On)	No Continuity (Off)
4010161	180° F (82° C) ± 3°F	149° F (65° C) ± 8°F

FLYWHEEL IDENTIFICATION

The flywheel can be identified by the stamp mark in location A or B. Refer to “I.D.” location in chart below. Do not use the cast mark to determine flywheel application.

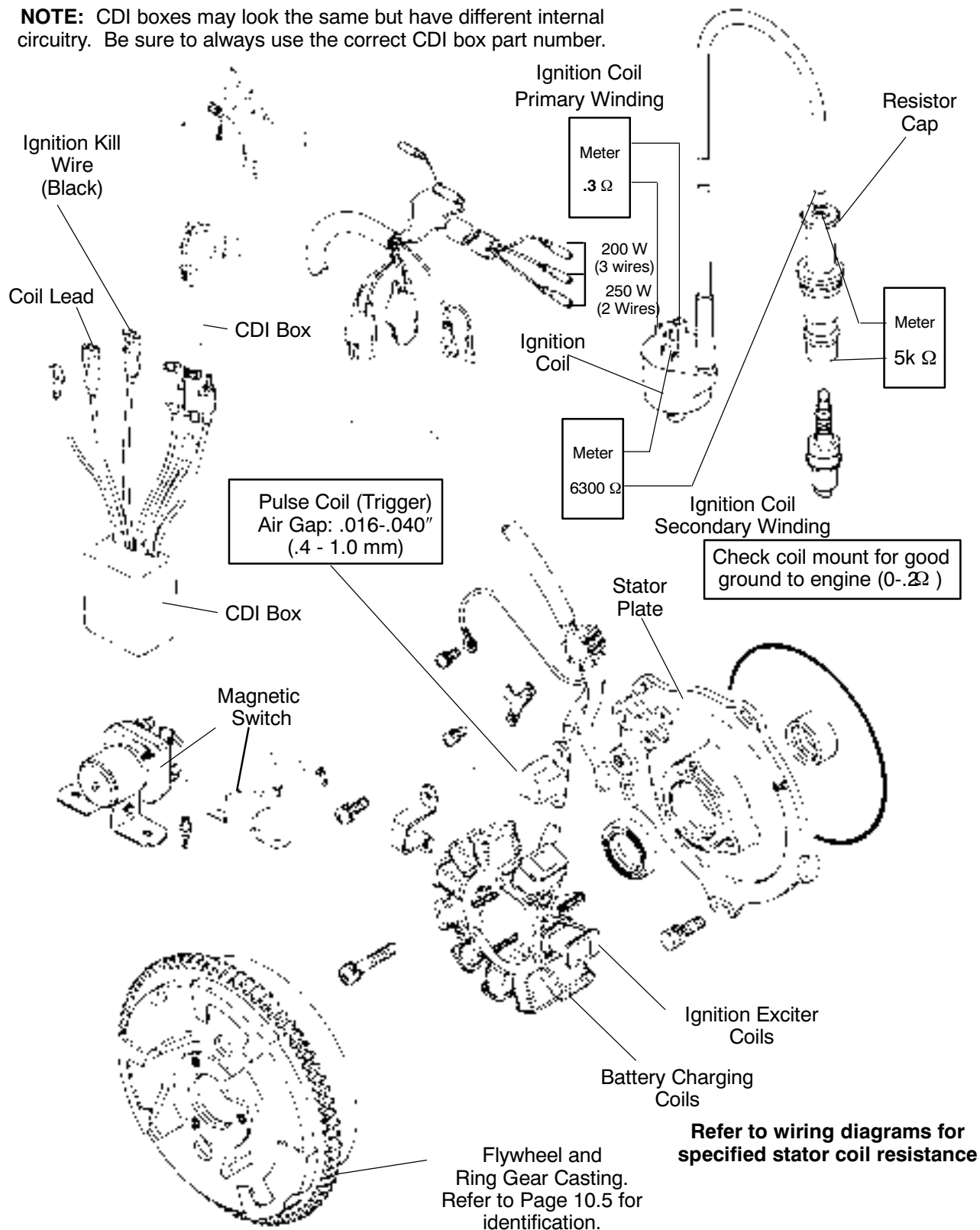


Engine Application	Stamp	Cast	Comment
EH42PLE/ EH50PLE	10	FF9706	250W



COMPONENTS OF 200/250 WATT ALTERNATOR

NOTE: CDI boxes may look the same but have different internal circuitry. Be sure to always use the correct CDI box part number.

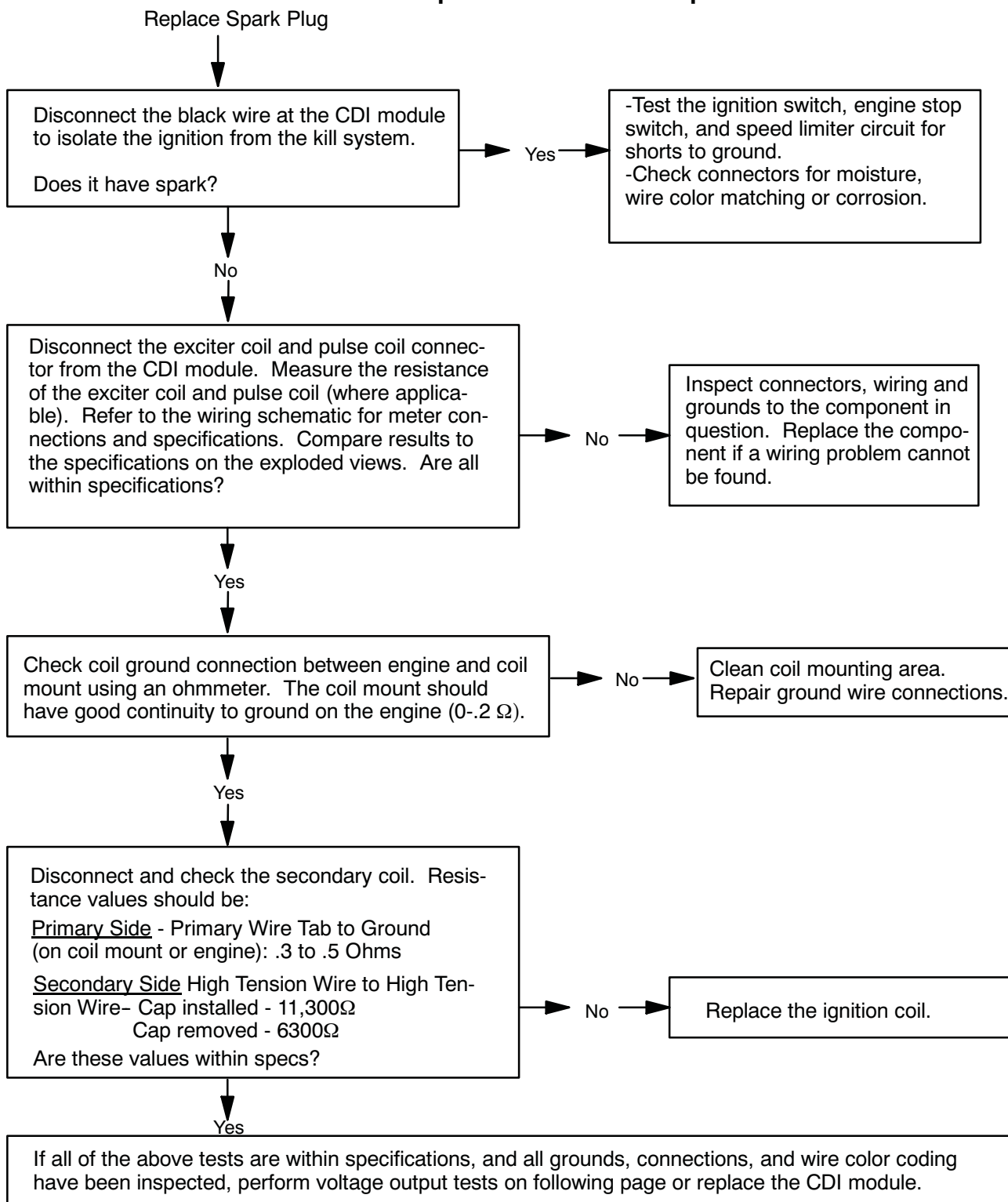




IGNITION SYSTEM TESTING FLOW CHART

Whenever troubleshooting an electrical problem, first check all terminal connections to be sure they are clean and tight. Also be sure that colors match when wires are connected. Use the following pages as a guide for troubleshooting. The resistance values are also given on the specification pages.

Condition: No Spark or intermittent spark





IGNITION SYSTEM TROUBLESHOOTING

No Spark, Weak or Intermittent Spark

- Spark plug gap incorrect
- Fouled spark plug
- Faulty spark plug cap or poor connection to high tension lead
- Related wiring loose, disconnected, shorted, or corroded
- Engine Stop switch or ignition switch faulty
- ETC switch misadjusted or faulty
- Wire harness or connections wet, corroded
- Poor ignition coil ground (e.g. coil mount loose or corroded)
- Faulty stator (measure resistance of all ignition related windings)
- Incorrect wiring (inspect color coding in connectors etc)
- Faulty ignition coil winding (measure resistance of primary and secondary)
- Worn magneto (RH) end Crankshaft bearings
- Sheared flywheel key
- Flywheel loose or damaged
- Trigger coil air gap too wide (where applicable) - should be .016-.040" (.4-1.0 mm)
- Excessive crankshaft runout on magneto (RH) end - should not exceed .0024"
- Faulty CDI module

CDI OUTPUT TEST USING PEAK READING ADAPTOR

Re-connect all CDI wires to stator wires. Disconnect CDI module wire from ignition coil primary terminal. Connect one meter lead to engine ground and the other to the ignition coil primary wire leading from the CDI module. Crank engine and check output of CDI wire to coil (130 DCV). Reconnect coil wire to CDI.

Output w/ Peak output tester
130 DCV
Average Output w/ Digital Voltmeter 20
DCV

CDI CRANKING OUTPUT TEST WITH PEAK READING VOLTMETER

The following peak voltage tests will measure the amount of output directly from each component. A peak reading voltmeter must be used to perform the tests. A variety of peak reading adaptors are commercially available for use with the Fluke™ 77 Digital Multitester (**PV-43568**) and other digital VOMs which will allow peak voltage tests to be performed accurately. Follow the directions provided with the adaptor. All measurements are indicated in DC Volts. Readings obtained without a peak reading adaptor will be significantly different.

Disconnect the stator connectors from the CDI module. Test output from exciter coil, pulse (trigger) coil, and compare to the chart. The following measurements are obtained when cranking the engine with the electric starter, spark plug installed. The starter system must be in good condition and the battery fully charged.

250 Watt 4 Stroke

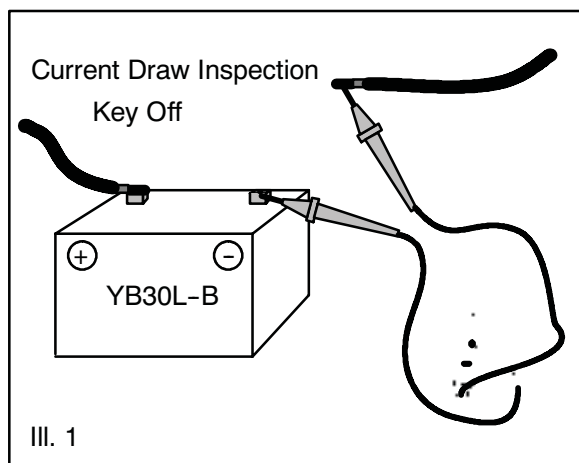
Coil	Connect Meter Wires To:	Reading (With Peak Reading Volt meter)
Exciter 1	Black/Red and Red	34 DCV
Pulse (Trigger)	White/Red and White	3.3 DCV

CURRENT DRAW - KEY OFF

CAUTION: Do not connect or disconnect the battery cable or ammeter with the engine running. Damage will occur to electrical components.

Connect an ammeter in series with the negative battery cable. Check for current draw with the key off. If the draw is excessive, loads should be disconnected from the system one by one until the draw is eliminated. Check component wiring as well as the component for partial shorts to ground to eliminate the draw.

Refer to Illustration 1 on the next page.



Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

CHARGING SYSTEM “BREAK EVEN” TEST

CAUTION: *Do not allow the battery cable or ammeter to become disconnected with the engine running. Follow the steps below as outlined to reduce the chance of damage to electrical components.*

WARNING: Never start the engine with the ammeter connected in series. Damage to the meter or meter fuse will result. Do not run test for extended period of time. Do not run test with high amperage accessories.

The “break even” point of the charging system is the point at which the alternator overcomes all system loads (lights, etc.) and begins to charge the battery. Depending on battery condition and system load, the break even point may vary slightly. The battery should be fully charged before performing this test.

1. Connect a tachometer according to manufacturer’s instructions.
2. With the negative cable still connected to the battery, connect one meter lead (set to DC amps) to the battery post and the other to the negative battery cable
3. With engine off and the key and kill switch in the ON position, the ammeter should read negative amps (battery discharge). Reverse meter leads if a positive reading is indicated.
4. Shift transmission into neutral and start the engine. With the engine running at idle, disconnect the negative cable from the battery post without disturbing the meter leads. Observe meter readings

5. Increase engine RPM while observing ammeter and tachometer.
6. Note RPM at which the battery starts to charge (ammeter indication is positive).
7. With lights and other electrical load off, the “break even” point should occur at approximately 1500 RPM or lower.
8. Turn the lights on and engage parking brake lock to keep brake light on.
9. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

ALTERNATOR OUTPUT TEST (AC AMP)

This test measures AC amperage from the alternator.

CAUTION: This test simulates a “full load” on the alternator at idle. Do not increase idle RPM or perform this test longer than required to obtain a reading. The alternator stator windings may overheat. 3-5 seconds is acceptable.

To Calculate Available Alternator Output

$$I = \frac{P}{E} \quad \frac{200W}{12V} = 16.7 \text{ Amps}$$
$$\frac{250W}{12V} = 20.8 \text{ Amps}$$

I = Current in Amps

P = Power in Watts

E = Electromotive Force (Volts)

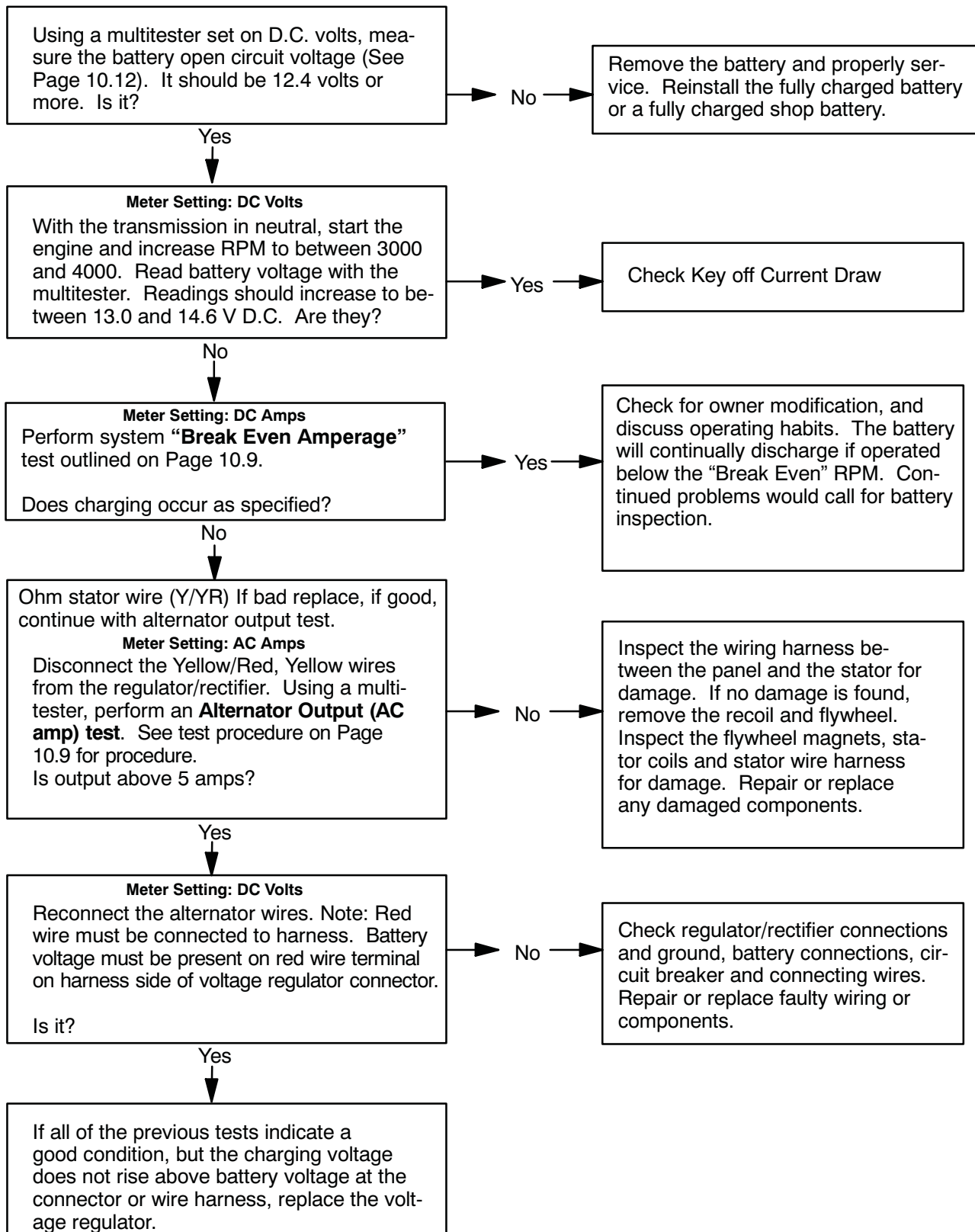
1. Maximum alternator output will be indicated on the meter. DO NOT increase engine RPM above idle.
2. Place the red lead on the tester in the 10A jack.
3. Turn the selector dial to the AC amps (A \square) position.
4. Connect the meter leads to the Yellow and Yellow/Red wires leading from the alternator.
5. Start the engine and let it idle. Reading should be a minimum of 7A/AC at idle.

Alternator Current Output:
Minimum of 7 AC Amps at Idle



CHARGING SYSTEM TESTING FLOW CHART

Whenever charging system problems are suspected, proceed with the following system check.





INITIAL BATTERY ACTIVATION

⚠ WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

WARNING: The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. If battery acid gets on anyone, wash the affected area with large quantities of cool water and seek immediate medical attention.

To ensure maximum service life and performance from a new battery, perform the following steps.

NOTE: Do not service the battery unless it will be put into regular service within 30 days. After initial service, **add only distilled water** to the battery. Never add electrolyte after a battery has been in service.

NOTE: New Battery: Battery must be fully charged before use or battery life will be significantly reduced 10-30% of the battery's full potential.

To activate a new battery:

1. Remove vent plug from vent fitting. Remove cell caps.
2. Fill battery with electrolyte to upper level marks on case.
3. Set battery aside to allow for acid absorption and stabilization for 30 minutes.
4. Add electrolyte to bring level back to upper level mark on case. **NOTE:** This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.
5. Charge battery at 1/10 of its amp/hour rating. Examples: 1/10 of 9 amp battery = .9 amp; 1/10 of 14 amp battery = 1.4 amp; 1/10 of 18 amp

battery = 1.8 amp (recommended charging rates).

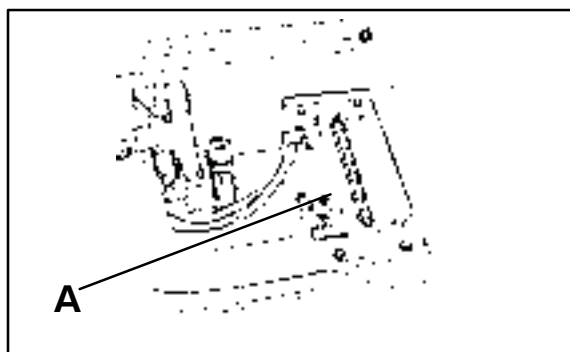
6. Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

BATTERY TERMINALS/TERMINAL BOLTS

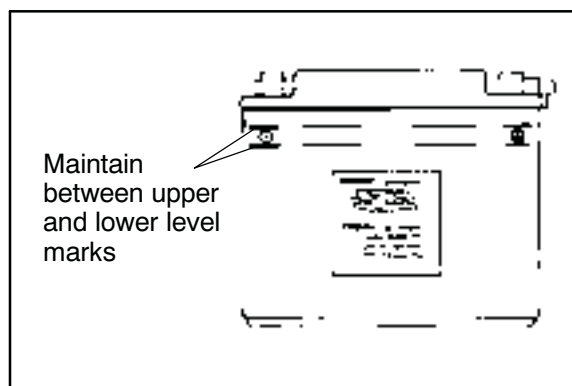
Use Polaris corrosion resistant Dielectric Grease (PN 2871329) on battery bolts. See Battery Installation on Page 10.12.

BATTERY INSPECTION/REMOVAL

The battery is located under the seat on the drivers side (A).



Inspect the battery fluid level. When the battery fluid nears the lower level, remove the battery and fill with distilled water to the upper level line. To remove the battery:



1. Disconnect holder strap and remove cover.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



⚠ CAUTION

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

- Remove the battery.
- Remove the filler caps and add **distilled water only** as needed to bring each cell to the proper level. Do not overfill the battery.

⚠ Refill using only distilled water. Tap water contains minerals which are harmful to a battery.

⚠ Do not allow cleaning solution or tap water inside the battery. Battery life may be reduced.

- Reinstall the battery caps.

BATTERY INSTALLATION

- Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
- Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Dielectric Grease (PN 2871329).
- Install clear battery vent tube from vehicle to battery vent. **WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. The vent tube should be routed away from frame and body to prevent contact with electrolyte. Avoid skin contact with electrolyte, as severe burns could result. If electrolyte contacts the vehicle frame, corrosion will occur.
- Route the cables correctly.
- Reinstall the holder strap.

BATTERY TESTING

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are three tests which can easily be made on a battery to determine its condition: OCV Test, Specific Gravity Test and Load Test.

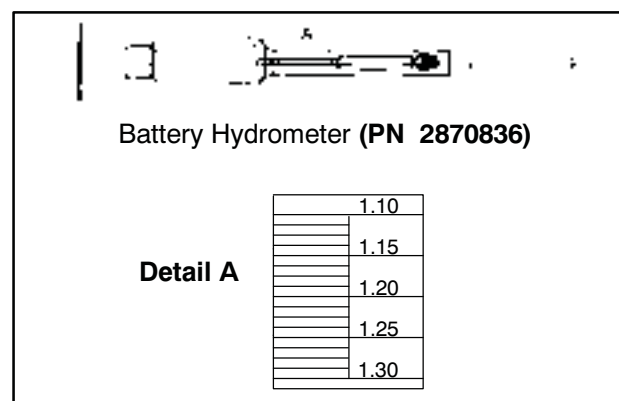
OCV - OPEN CIRCUIT VOLTAGE TEST

Battery voltage should be checked with a digital multimeter. Readings of 12.6 volts or less require further battery testing and charging. See charts and Load Test on below.

NOTE: Lead-acid batteries should be kept at or near a full charge as possible. Electrolyte level should be kept between the low and full marks. If the battery is stored or used in a partially charged condition, or with low electrolyte levels, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

SPECIFIC GRAVITY TEST

A tool such as a Battery Hydrometer (PN 2870836) can be used to measure electrolyte strength or specific gravity. As the battery goes through the charge/discharge cycle, the electrolyte goes from a heavy (more acidic) state at full charge to a light (more water) state when discharged. The hydrometer can measure state of charge and differences between cells in a multi-cell battery. Readings of 1.270 or greater should be observed in a fully charged battery. Differences of more than .025 between the lowest and highest cell readings indicate a need to replace the battery.



OPEN CIRCUIT VOLTAGE		
State of charge	Conventional Lead-acid	YuMicron™ Type
100% Charged	12.60V	12.70V
75% Charged	12.40V	12.50V
50% Charged	12.10V	12.20V
25% Charged	11.90V	12.0V
0% Charged	less than 11.80V	less than 11.9V

Continued on next page



SPECIFIC GRAVITY		
State of charge*	Conventional lead-acid	YuMicron™ Type
100% Charged	1.265	1.275
75% Charged	1.210	1.225
50% Charged	1.160	1.175
25% Charged	1.120	1.135
0% Charged	less than 1.100	less than 1.115

* At 80°F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

LOAD TEST

CAUTION: *To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.*

NOTE: This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered. To perform this test, hook a multitester to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the starter and observe the battery voltage while cranking the engine. Continue the test for 15 seconds. During cranking the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 volts or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

OFF SEASON STORAGE

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove the battery from the machine and wash the case and battery tray with a mild solution of baking soda and water. Rinse with lots of fresh water after cleaning. **NOTE:** Do not get any of the baking soda into the battery or the acid will be neutralized.
- Using a wire brush or knife, remove any corrosion from the cables and terminals.
- Make sure that the electrolyte is at the proper level. Add distilled water if necessary.

- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the electrolyte's specific gravity reaches 1.270 or greater.
- Store the battery either in the machine with the cables disconnected, or store in a cool place.

NOTE: Stored batteries lose their charge at the rate of 1% per day. Recharge to full capacity every 30 to 60 days during a non-use period. If the battery is stored during the winter months, electrolyte will freeze at higher temperatures as the battery discharges. The chart below indicates freezing points by specific gravity.

Electrolyte Freezing Points	
Specific Gravity of Electrolyte	Freezing Point
1.265	-75° F
1.225	-35° F
1.200	-17° F
1.150	+5° F
1.100	+18° F
1.050	+27° F

CHARGING PROCEDURE

1. Remove the battery from the ATV to prevent damage from leaking or spilled acid during charging.
2. Charge the battery with a charging output no larger than 1/10 of the battery's amp/hr rating. Charge as needed to raise the specific gravity to 1.270 or greater.
3. Install battery in vehicle with positive terminal toward the front. Coat threads of battery bolt with a corrosion resistant dielectric grease.

Dielectric Grease

(PN 2871329)

4. Connect battery cables.

⚠ WARNING

To avoid the possibility of explosion, connect positive (red) cable first and negative (black) cable last.

5. After connecting the battery cables, install the cover on the battery and attach the hold down strap.

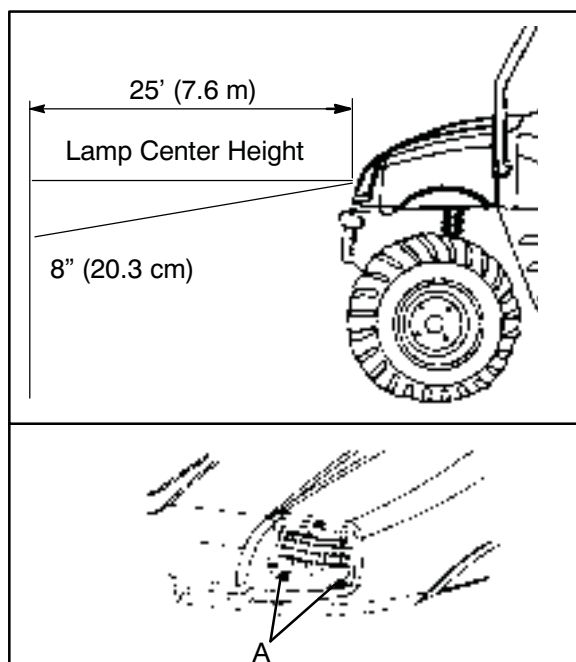


6. Install clear battery vent tube from vehicle to battery vent. **WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. Vent should be routed away from frame and body to prevent contact with electrolyte. Avoid skin contact with electrolyte, as severe burns could result. If electrolyte contacts the vehicle frame, corrosion will occur.
7. Route cables so they are tucked away in front and behind battery.

HIGH BEAM HEADLIGHT ADJUSTMENT

The headlight beam can be adjusted to any position desired by turning the adjusting knob located on the bottom right side of the headlight pod.

1. Place the vehicle on a level surface with the headlight approximately 25' (7.6 m) from a wall.



2. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
3. Start the engine and turn the headlight switch to high beam.
4. Observe headlight aim. The most intense part of the headlight beam should be aimed 2" (5.1 cm) below the mark placed on the wall in Step 2
NOTE: Rider weight must be included in the seat. On machines with separate low beam lights, the

drop should be 8" (20.3 cm) in 25' from the center of the low beam lamp.

- Turn the right screw clockwise to adjust to the left.
- Turn the left screw clockwise to adjust to the right.
- Turn the bottom screw clockwise to adjust up.

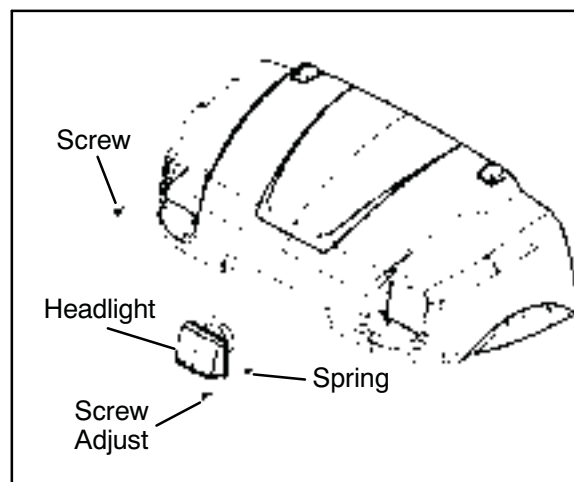


WARNING: Due to the nature of light utility vehicles and where they are operated, headlight lenses become dirty. Frequent washing is necessary to maintain lighting quality. Riding with poor lighting can result in severe injury or death.

5. Adjust beam to desired position .

HEADLIGHT HOUSING REPLACEMENT

1. Open the hood.
2. Disconnect wire harness to headlamp.
3. Remove screws and spring.
4. Remove headlight.
5. Insert new bulb and reverse steps.



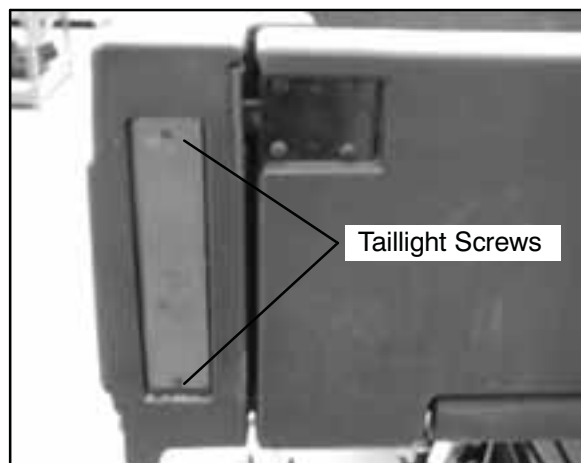
TAILLIGHT/BRAKELIGHT LAMP REPLACEMENT

If the taillight/brakelight does not work the lamp may need to be replaced.

1. From the rear of the taillight remove two screws holding lens cover in place and remove lens cover.

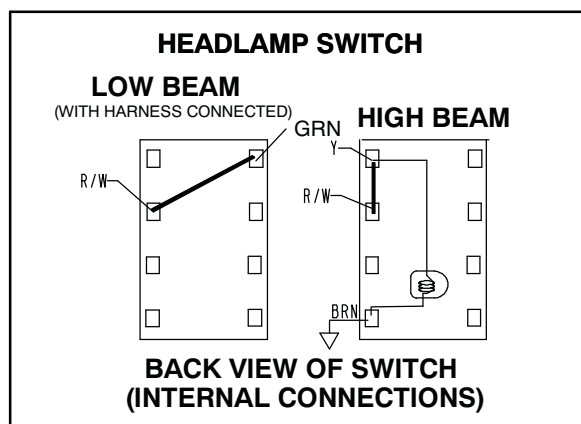


2. Remove lamp by turning the rubber base 1/4 turn and pulling the bulb out. Replace it with recommended lamp. Apply Dielectric Grease (PN 2871329).
3. Reinstall the lens cover removed in step 1.
4. Test the taillight/brakelight to see it is working.



HEADLAMP SWITCH

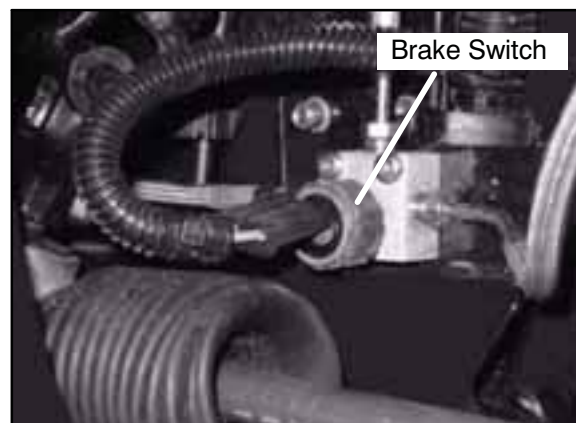
1. Lift the front hood.
2. The wires are located on the backside of the instrument panel.
3. Disconnect the headlamp switch harness (Brown, Green, and Yellow), by depressing the connector lock and pulling on the connector. Do not pull on the wiring.
4. Test the switch connections and compare to the illustration. The internal headlight switch connections are shown in the illustration to the right.



BRAKE LIGHT SWITCH

1. Turn the steering wheel to the right and look behind the front left tire for the brake junction

block. The brake pressure switch is installed into this block.

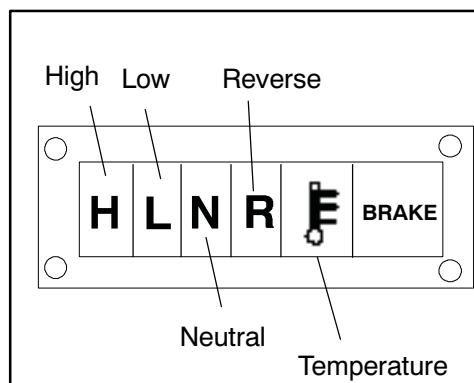


2. Disconnect wire harness from switch.
3. Connect an ohmmeter across switch contacts. Reading should be infinite (∞).
4. Apply foot brake and check for continuity between switch contacts. If there is no continuity or greater than .5 ohms resistance when the brake is applied with slight pressure, first clean the switch contacts and re-test. Replace switch if necessary.

GEAR INDICATOR LIGHT CIRCUIT OPERATION

The transmission switch provides the ground path for the indicator lamps located on the dashboard. For example, when neutral is selected, Green/White wire connected to ground throughout the switch and the neutral lamp is illuminated.

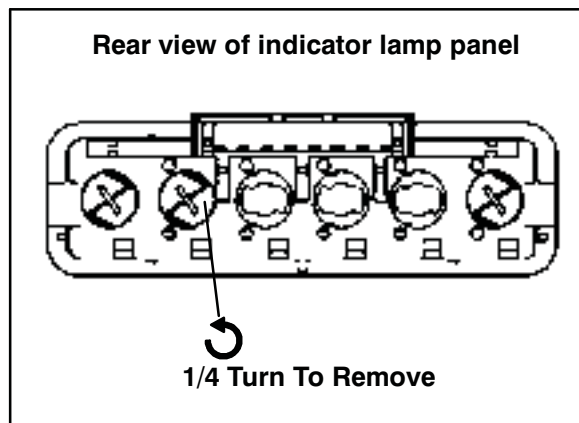
If the light does not illuminate when neutral is selected, check the bulb. If the bulb is good, check the wiring, transmission switch, and lamp socket source voltage. Perform the same test for all four gear indicators. Refer to the wire diagram for wire colors.





INDICATOR LAMP REPLACEMENT

1. Disconnect indicator light harness from the panel by lifting the retaining latch.
2. To remove defective lamp: Use a small screwdriver and turn lamp holder a quarter turn, pull the bulb assembly out with a needle nose pliers or equivalent. Replace with a new bulb assembly.



STARTER SYSTEM TROUBLESHOOTING

Starter Motor Does Not Turn

- Battery discharged. Low specific gravity
- Loose or faulty battery cables or corroded connections (see Voltage Drop Tests)
- Related wiring loose, disconnected, or corroded
- Poor ground connections at battery cable, starter motor or starter solenoid (see Voltage Drop Tests)
- Faulty key switch
- Faulty kill switch
- Faulty starter solenoid or starter motor.
- Engine problem - seized or binding (Can engine be rotated easily with recoil starter?)

Starter Motor Turns Over Slowly

- Battery discharged - low specific gravity
- Excessive circuit resistance - poor connections (see Voltage Drop Test below)
- Engine problem - seized or binding (Can engine be rotated easily?)
- Faulty or worn brushes in starter motor
- Automatic compression release inoperative

Starter Motor Turns - Engine Does Not Rotate

- Faulty starter drive
- Faulty starter drive gears or starter motor gear
- Faulty flywheel gear or loose flywheel

VOLTAGE DROP TEST

The Voltage Drop Test is used to test for bad connections. When performing the test, you are testing the amount of voltage drop through the connection. A poor or corroded connection will appear as a high voltage reading. Voltage shown on the meter when testing connections should not exceed .1 VDC per connection or component.

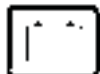
To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the chart on 10.27 to perform voltage drop tests on the starter system.

**Voltage should not exceed
.1 DC volts per connection**

STARTER MOTOR DISASSEMBLY

NOTE: Use only electrical contact cleaner to clean starter motor parts. Some solvents may leave a residue or damage internal parts and insulation.

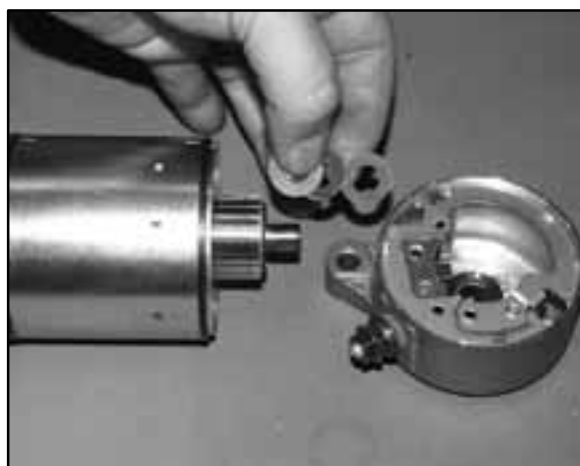
1. Note the alignment marks on both ends of the starter motor casing. These marks must align during reassembly.



2. Remove the two bolts, washers, and sealing O-Rings. Inspect O-Rings and replace if damaged.

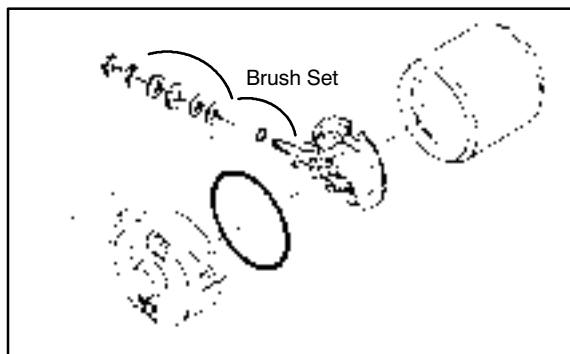


3. Remove brush terminal end of housing while holding other two sections together.



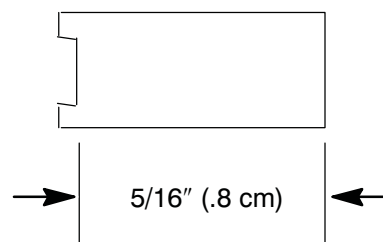
4. Remove shims from armature shaft. **NOTE:** All shims must be replaced during reassembly.

BRUSH **INSPECTION/REPLACEMENT**



1. Using a digital multimeter, measure the resistance between the cable terminal and the insulated brush. The reading should be .3 ohms or less. Measure the resistance between the cable terminal and brush housing. Make sure the brush is not touching the case. The reading should be infinite.
2. Remove nut, flat washer, large phenolic washer, two small phenolic washers, and O-Ring from brush terminal. Inspect the O-Ring and replace if damaged.

Brush Length



Brush Length Service Limit:
5/16" (.8 cm)

3. Remove brush plate and brushes. Measure length of brushes and replace if worn past the service limit. Replace springs if they are discolored or have inadequate tension.
4. Inspect surface of commutator for wear or discoloration. See Steps 3-6 of armature testing on Page 10.18.
5. Install a new carbon brush assembly in the brush housing. **NOTE:** Be sure that the terminal bolt insulating washer is properly seated in the



housing, and the tab on the brush plate engages the notch in the brush plate housing.

6. Place a wrap of electrical tape on the threads of the terminal bolt to prevent O-Ring damage during reinstallation.
7. Install the O-Ring over the bolt. Make sure the O-ring is fully seated.



8. Remove the electrical tape and reinstall the two small phenolic washers, the large phenolic washer, flat washer, and nut.



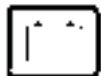
4. Measure the resistance between each commutator segment and the armature shaft. The reading should be infinite (no continuity).
5. Check commutator bars for discoloration. Bars discolored in pairs indicate shorted coils, requiring replacement of the starter motor.
6. Place armature in a growler. Turn growler on and position a hacksaw blade or feeler gauge lengthwise 1/8" (.3 cm) above armature coil laminates. Rotate armature 360°. If hacksaw blade is drawn to armature on any pole, the armature is shorted and must be replaced.

ARMATURE TESTING

1. Remove armature from starter casing. Note order of shims on drive end for reassembly.
2. Inspect surface of commutator. Replace if excessively worn or damaged.



3. Using a digital multitester, measure the resistance between each of the commutator segments. The reading should be .3 ohms or less.



STARTER ASSEMBLY



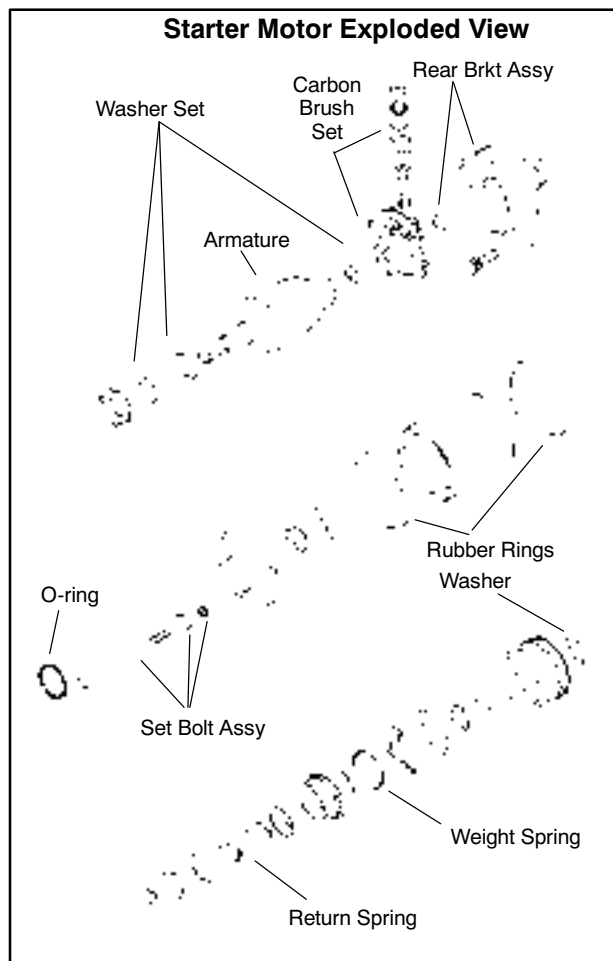
1. Place armature in field magnet casing.
2. Place shims on drive end of armature shaft with phenolic washer outermost on shaft. Engage tabs of stationary washer in drive end housing, holding it in place with a light film of grease.
3. Install case sealing O-Ring. Make sure O-Ring is in good condition and not twisted on the case. Lubricate needle bearing and oil seal with a light film of grease, and install housing, aligning marks.
4. Install O-Ring on other end of field magnet casing. Make sure it is in good condition and not twisted on the case.
5. Align casing marks and install housing, pushing back brushes while installing shaft in bushing.
6. Reinstall starter motor housing bolts. Make sure O-Rings are in good condition and seated in groove.
7. Inspect permanent magnets in starter housing. Make sure they are not cracked or separated from housing.

CAUTION: Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.

STARTER DRIVE

Pinion Gear - Anti Kick-out Shoe, Garter Spring Replacement

If the garter spring is damaged, the overrun clutch may fail to return properly. The replacement spring is (PN 7042039). Use either of the following methods to remove and install a new garter spring.

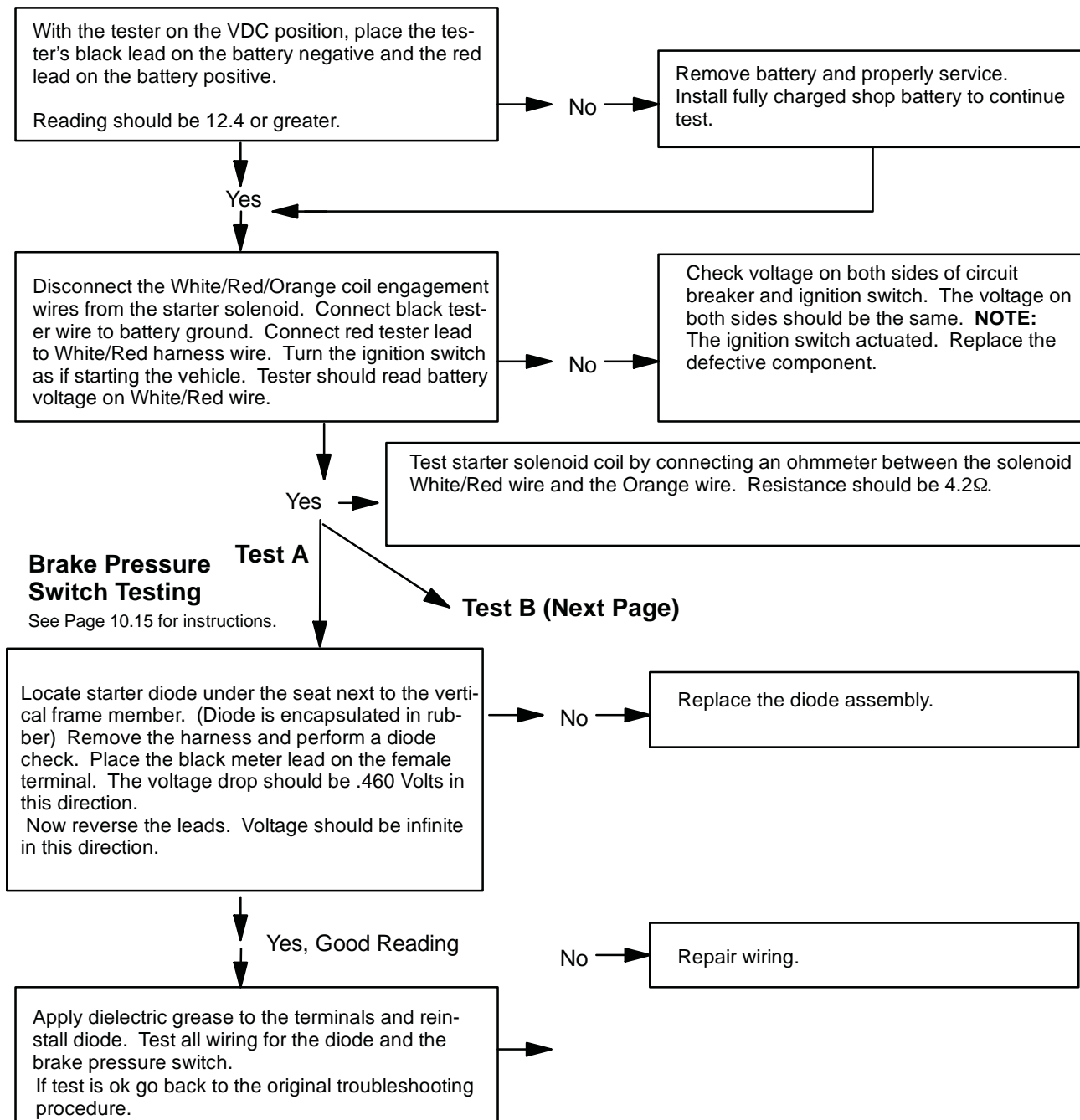




STARTER SYSTEM TEST FLOW CHART

Condition: Starter fails to turn motor. **NOTE:** Make sure engine crankshaft is free to turn before proceeding with dynamic testing of starter system. A digital multimeter must be used for this test.

NOTE: The footbrake must be compressed for the starter circuit to engage.





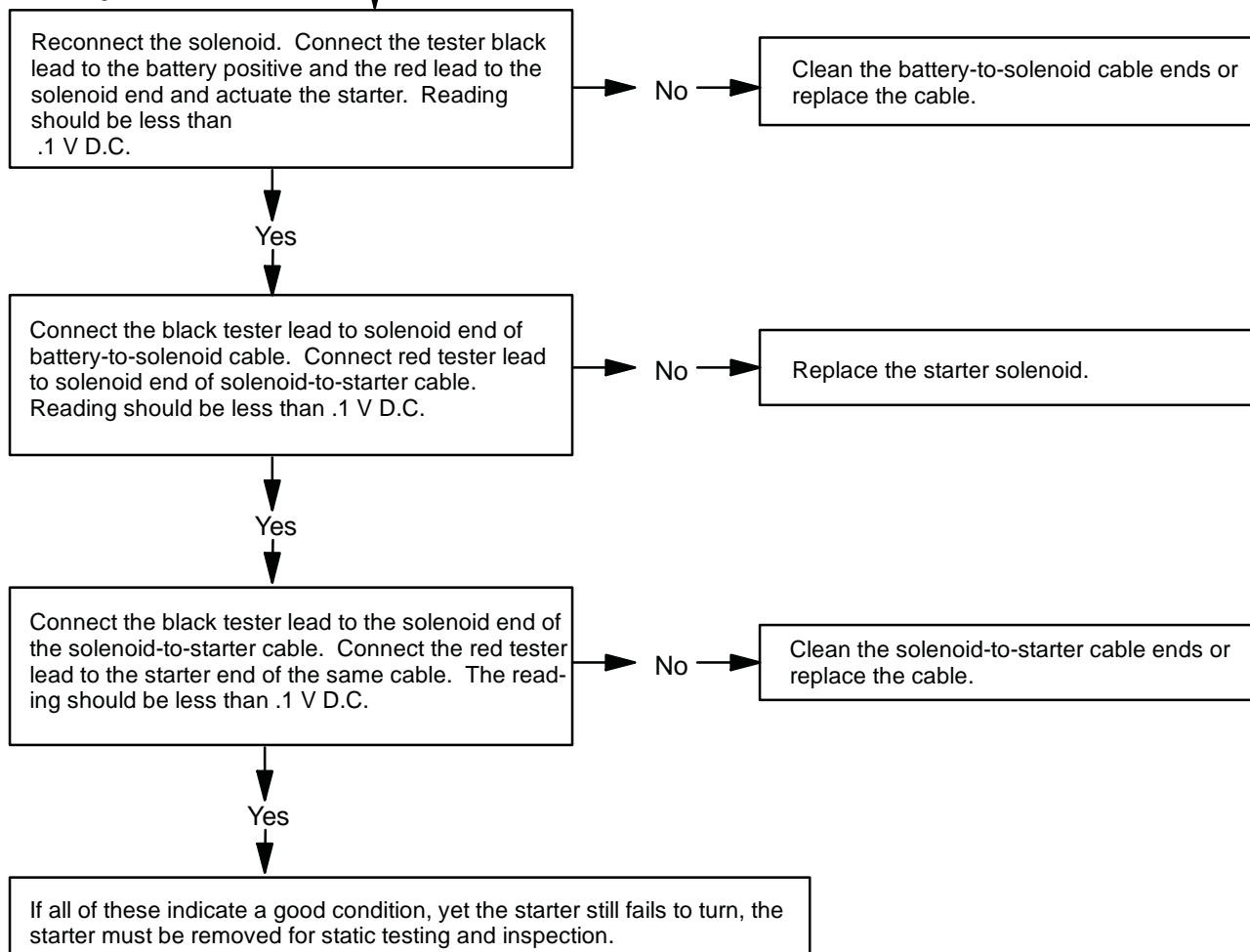
STARTER SYSTEM TEST FLOW CHART, CON'T

Test B (from previous page)

Voltage Drop Testing

See Page 10.16 for instructions.

Continued from previous page

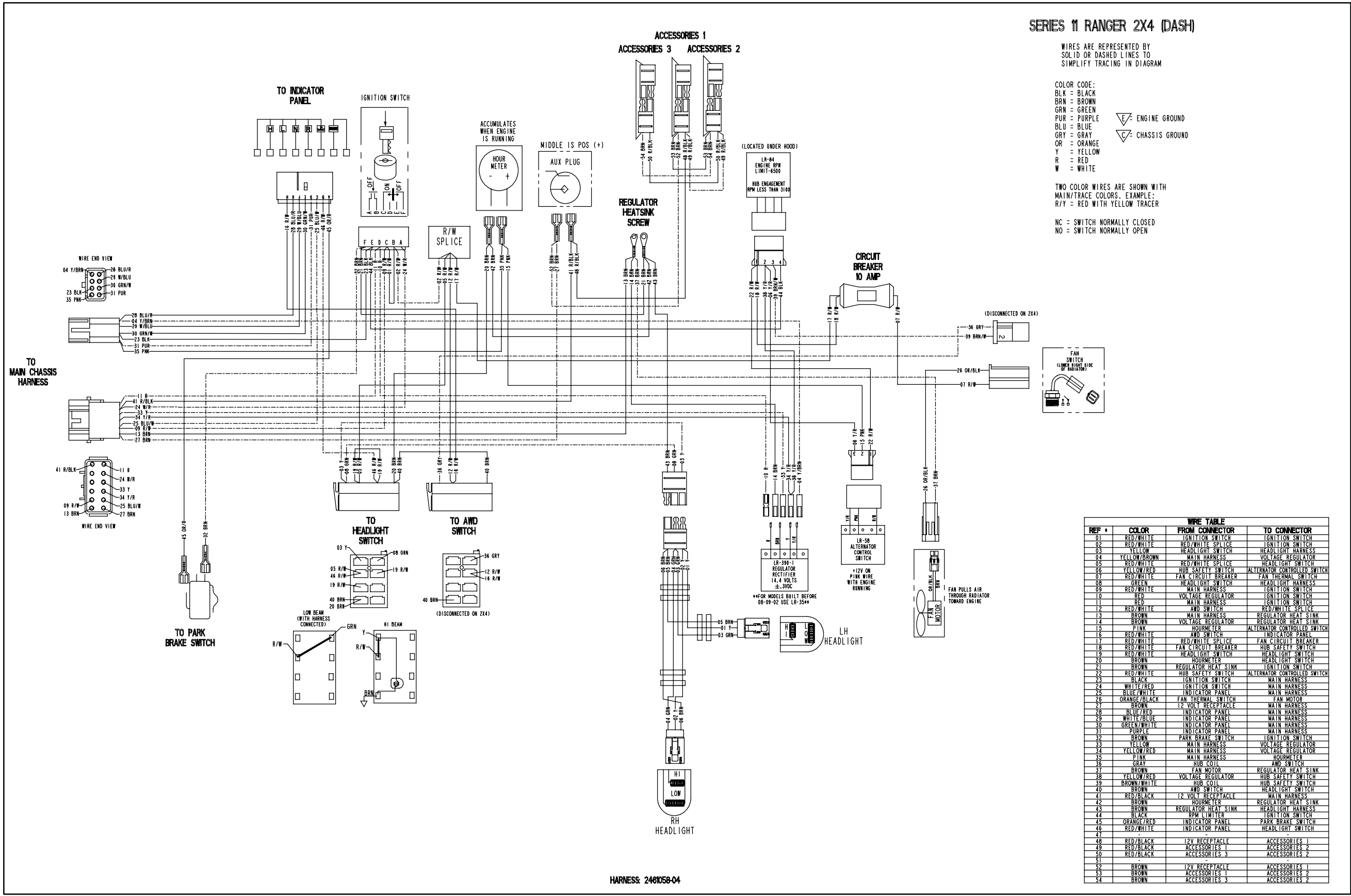


This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines across the entire width of the page, providing a guide for handwriting or typing. The background is a solid off-white color.

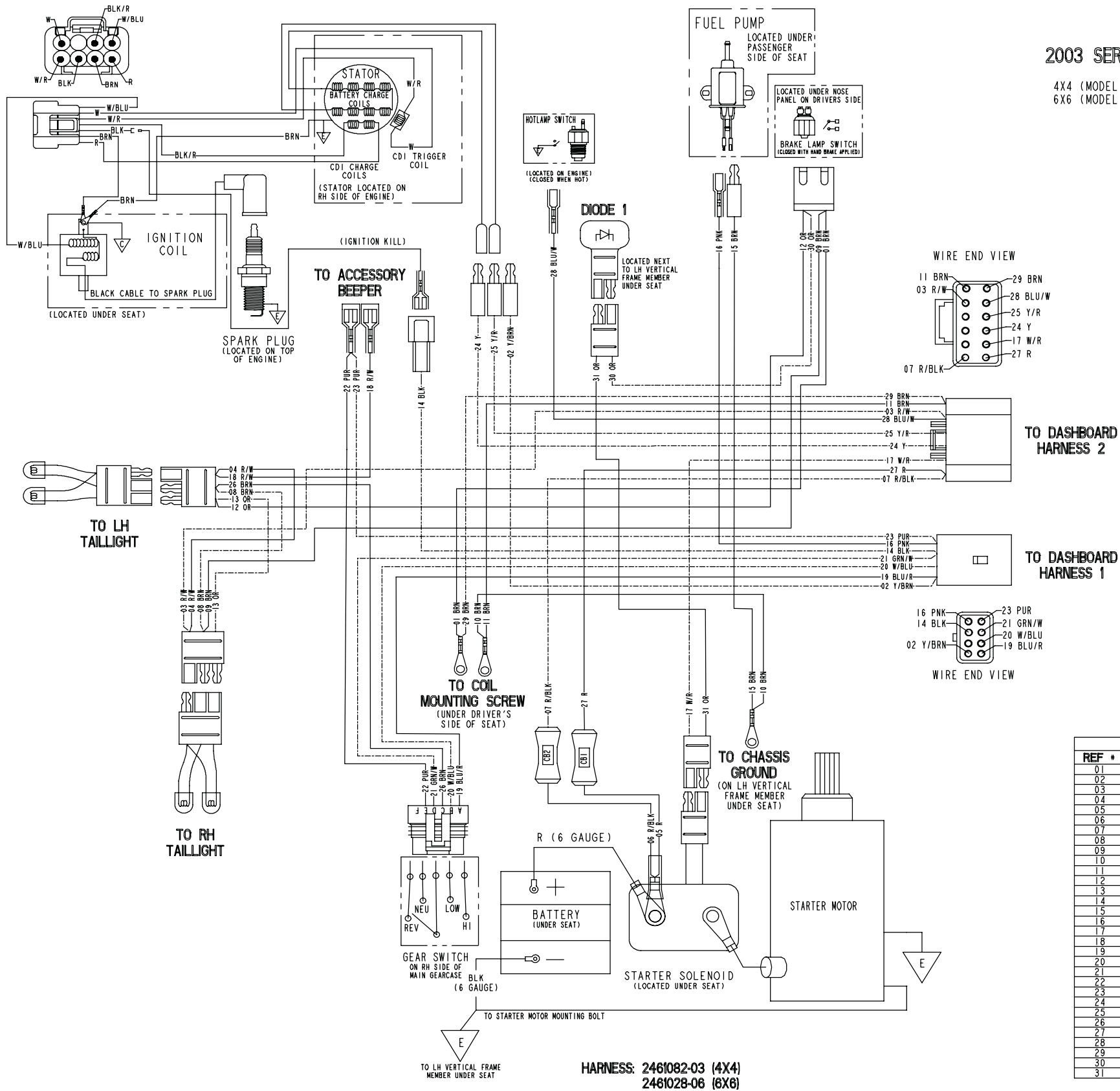
WIRING



WIRING DIAGRAM SERIES 11 RANGER 2X4



HARNESS: 246D58-04



RESISTANCE (±20% @ 68°F/20°C)		
STATOR	CAPACITOR CHARGE COIL	R TO BLK/R 19 OHMS
		R TO GROUND NO CONNECTION
	TRIGGER COIL	W TO W/R 97 OHMS
		W TO GROUND NO CONNECTION
	BATTERY CHARGE COIL	Y TO Y/R 0.22 OHMS
		Y TO GROUND NO CONNECTION
IGNITION COIL	PRIMARY	0.3 OHMS
	SECONDARY	6300 OHMS (PLUS) 5000 OHMS (CAP)

WIRE TABLE			
REF #	COLOR	FROM CONNECTOR	TO CONNECTOR
01	BROWN	BRAKE PRESSURE SWITCH	COIL MOUNTING SCREW
02	YELLOW/BROWN	DASH HARNESS	STATOR HARNESS
03	RED/WHITE	DASH HARNESS	RH TAILLIGHT
04	RED/WHITE	LH TAILLIGHT	RH TAILLIGHT
05	RED	STARTER SOLENOID +	CIRCUIT BREAKER 1
06	RED/BLACK	STARTER SOLENOID +	CIRCUIT BREAKER 2
07	RED/BLACK	CIRCUIT BREAKER 2	DASH HARNESS
08	BROWN	LH TAILLIGHT	RH TAILLIGHT
09	BROWN	BRAKE PRESSURE SWITCH	RH TAILLIGHT
10	BROWN	COIL MOUNTING SCREW	CHASSIS GROUND
11	BROWN	COIL MOUNTING SCREW	DASH HARNESS
12	ORANGE	LH TAILLIGHT	BRAKE PRESSURE SWITCH
13	ORANGE	LH TAILLIGHT	RH TAILLIGHT
14	BLACK	CDI STOP WIRE	DASH HARNESS
15	BROWN	CHASSIS GROUND	FUEL PUMP
16	PINK	FUEL PUMP	DASH HARNESS
17	WHITE/RED	STARTER SOLENOID	DASH HARNESS
18	RED/WHITE	LH TAILLIGHT	ACCESSORY BEEPER
19	BLUE/RED	GEAR SWITCH	DASH HARNESS
20	WHITE/BLUE	GEAR SWITCH	DASH HARNESS
21	GREEN/WHITE	GEAR SWITCH	DASH HARNESS
22	PURPLE	GEAR SWITCH	ACCESSORY BEEPER
23	PURPLE	ACCESSORY BEEPER	DASH HARNESS
24	YELLOW	STATOR HARNESS	DASH HARNESS
25	YELLOW/RED	STATOR HARNESS	DASH HARNESS
26	BROWN	LH TAILLIGHT	GEAR SWITCH
27	RED	CIRCUIT BREAKER 1	DASH HARNESS
28	BLUE/WHITE	ENGINE TEMP SWITCH	DASH HARNESS
29	BROWN	CDI MOUNTING SCREW	DASH HARNESS
30	ORANGE	BRAKE PRESSURE SWITCH	DIODE 1
31	ORANGE	STARTER SOLENOID	DIODE 1

WIRING DIAGRAM SERIES 11 RANGER 4X4 & 6X6

2003 SERIES 11 RANGER 4X4/6X6 (DASH)

4X4 (MODEL NO: A11RD50AA)
6X6 (MODEL NO: A11RF50AA)

WIRES ARE REPRESENTED BY
SOLID OR DASHED LINES TO
SIMPLIFY TRACING IN DIAGRAM

COLOR CODE:
BLK = BLACK
BRN = BROWN
GRN = GREEN
PUR = PURPLE
BLU = BLUE
GRY = GRAY
OR = ORANGE
Y = YELLOW
W = WHITE

⏏ = ENGINE GROUND
⏏ = CHASSIS GROUND

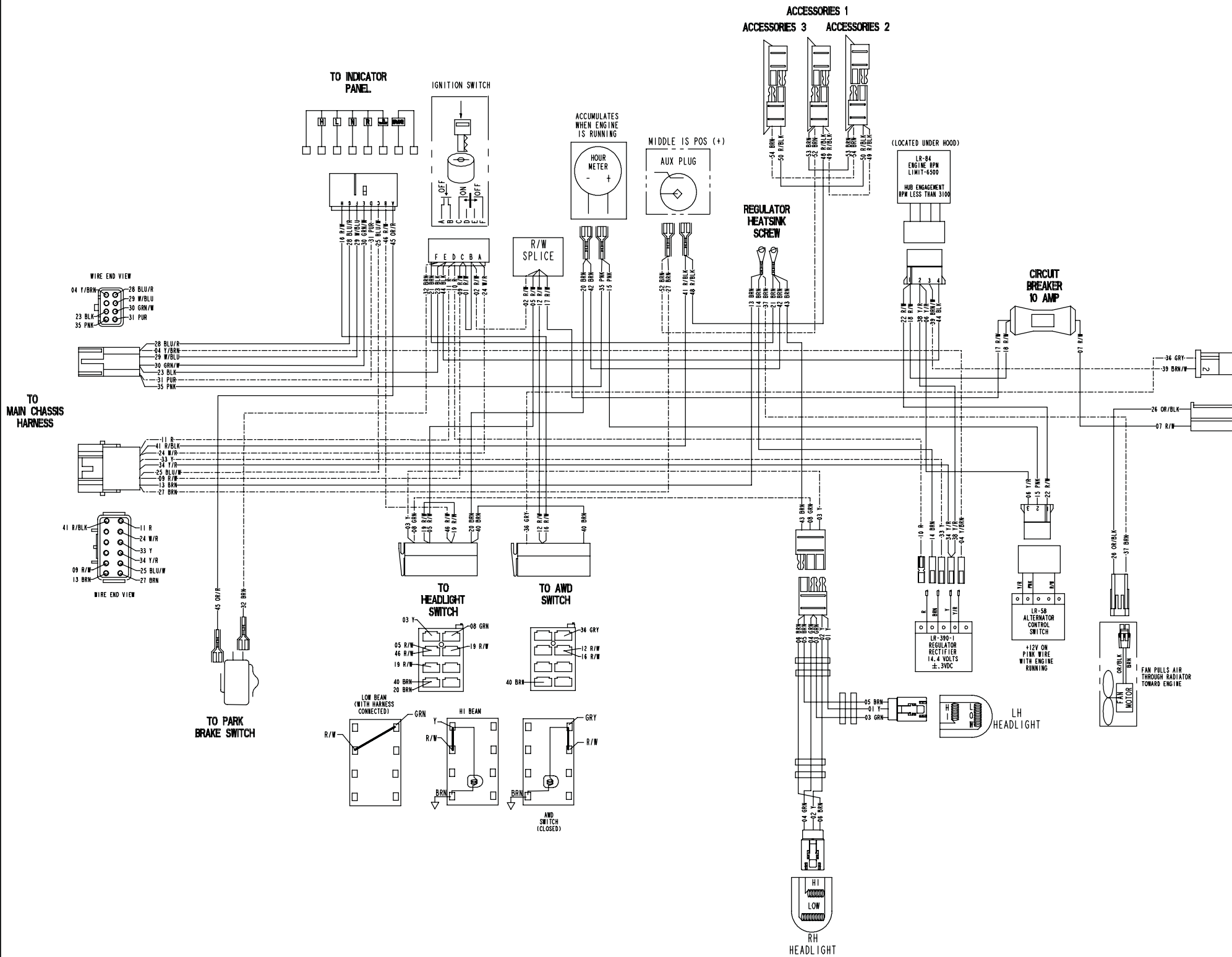
TWO COLOR WIRES ARE SHOWN WITH
MAIN/TRACE COLORS. EXAMPLE:
R/Y = RED WITH YELLOW TRACER

NC = SWITCH NORMALLY CLOSED
NO = SWITCH NORMALLY OPEN

AWD HUB COIL 4X4 ONLY
11 VOLTS MINIMUM
REQUIRED TO POWER
HUB COIL

FAN SWITCH
(LOWER RIGHT SIDE
OF INDICATOR)

WIRE TABLE			
REF #	COLOR	FROM CONNECTOR	TO CONNECTOR
01	RED/WHITE	IGNITION SWITCH	IGNITION SWITCH
02	RED/WHITE	RED/WHITE SPLICE	IGNITION SWITCH
03	YELLOW	HEADLIGHT SWITCH	HEADLIGHT SWITCH
04	YELLOW/BROWN	MAIN HARNESS	VOLTAGE REGULATOR
05	RED/WHITE	RED/WHITE SPLICE	HEADLIGHT SWITCH
06	YELLOW/RED	HUB SAFETY SWITCH	ALTERNATOR CONTROLLED SWITCH
07	RED/WHITE	FAN CIRCUIT BREAKER	FAN THERMAL SWITCH
08	GREEN	HEADLIGHT SWITCH	HEADLIGHT SWITCH
09	RED/WHITE	MAIN HARNESS	IGNITION SWITCH
10	RED	VOLTAGE REGULATOR	IGNITION SWITCH
11	RED	MAIN HARNESS	IGNITION SWITCH
12	RED/WHITE	AWD SWITCH	RED/WHITE SPLICE
13	BROWN	MAIN HARNESS	REGULATOR HEAT SINK
14	BROWN	VOLTAGE REGULATOR	REGULATOR HEAT SINK
15	PINK	HOURLY METER	ALTERNATOR CONTROLLED SWITCH
16	RED/WHITE	AWD SWITCH	INDICATOR PANEL
17	RED/WHITE	RED/WHITE SPLICE	FAN CIRCUIT BREAKER
18	RED/WHITE	FAN CIRCUIT BREAKER	HUB SAFETY SWITCH
19	RED/WHITE	HEADLIGHT SWITCH	HEADLIGHT SWITCH
20	BROWN	HOURLY METER	HEADLIGHT SWITCH
21	BROWN	REGULATOR HEAT SINK	IGNITION SWITCH
22	RED/WHITE	HUB SAFETY SWITCH	ALTERNATOR CONTROLLED SWITCH
23	BLACK	IGNITION SWITCH	MAIN HARNESS
24	WHITE/RED	IGNITION SWITCH	MAIN HARNESS
25	BLUE/WHITE	INDICATOR PANEL	MAIN HARNESS
26	ORANGE/BLACK	FAN THERMAL SWITCH	FAN MOTOR
27	BROWN	12 VOLT RECEPTACLE	MAIN HARNESS
28	BLUE/RED	INDICATOR PANEL	MAIN HARNESS
29	WHITE/BLUE	INDICATOR PANEL	MAIN HARNESS
30	GREEN/WHITE	INDICATOR PANEL	MAIN HARNESS
31	PURPLE	INDICATOR PANEL	MAIN HARNESS
32	BROWN	PARK BRAKE SWITCH	IGNITION SWITCH
33	YELLOW	MAIN HARNESS	VOLTAGE REGULATOR
34	YELLOW/RED	MAIN HARNESS	VOLTAGE REGULATOR
35	PINK	MAIN HARNESS	HOURLY METER
36	GRAY	HUB COIL	AWD SWITCH
37	BROWN	FAN MOTOR	REGULATOR HEAT SINK
38	YELLOW/RED	VOLTAGE REGULATOR	HUB SAFETY SWITCH
39	BROWN/WHITE	HUB COIL	HUB SAFETY SWITCH
40	BROWN	AWD SWITCH	HEADLIGHT SWITCH
41	RED/BLACK	12 VOLT RECEPTACLE	MAIN HARNESS
42	BROWN	HOURLY METER	REGULATOR HEAT SINK
43	BROWN	REGULATOR HEAT SINK	HEADLIGHT SWITCH
44	BLACK	RPM LIMITER	IGNITION SWITCH
45	ORANGE/RED	INDICATOR PANEL	PARK BRAKE SWITCH
46	RED/WHITE	INDICATOR PANEL	HEADLIGHT SWITCH
47			
48	RED/BLACK	12V RECEPTACLE	ACCESSORIES 1
49	RED/BLACK	ACCESSORIES 1	ACCESSORIES 2
50	RED/BLACK	ACCESSORIES 3	ACCESSORIES 2
51			
52	BROWN	12V RECEPTACLE	ACCESSORIES 1
53	BROWN	ACCESSORIES 1	ACCESSORIES 2
54	BROWN	ACCESSORIES 3	ACCESSORIES 2



HARNESS: 2481058-04